

REMOTE SENSING ASSESSMENT OF KAREZ IRRIGATION SYSTEMS AND  
ARCHAEOLOGICAL RESOURCES IN MAYWAND DISTRICT, KANDAHAR  
PROVINCE, AFGHANISTAN

By

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requirements for the degree of Doctor of Philosophy.

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**Abstract**

This dissertation focuses on the history, diffusion, and cultural significance of the *karez*, a form of traditional irrigation system, based on a case study of Maywand District in Kandahar Province, Afghanistan. Remote sensing and Geographic Information System (GIS) technology, offers methods for studying and protecting cultural heritage remains in regions subject to conflict in wartime. A long history of invasions and occupations has both produced and destroyed cultural heritage in Afghanistan that includes landscapes with small- and large-scale features such as mounds, architecture, and traditional gravity-driven water systems that serve areas of extreme aridity.

Remote sensing technologies such as satellite imagery, aerial photography, and Light Detection and Ranging (LiDAR) have been successful for identifying and analyzing archaeological remains, especially when ground verification is not feasible as is the case in southern Afghanistan. Ethnographic and archaeological data, as well as concepts developed from landscape archaeology, are used to interpret karezes and related features identified in remotely sensed imagery.

This research identifies karezes as cultural heritage that should be protected, revitalized, and promoted as well as a form of appropriate technology that provides renewable and sustainable sources of water. Karezes promote community cohesion over time by promoting and perpetuating indigenous knowledge based on long-term experience. They provide local stakeholders with the tools necessary for success before and after foreign occupation in southern Afghanistan.

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## **I. CHAPTER ONE**

In this chapter, I provide a brief discussion of cultural heritage protection and the U.S. military's role in it. I discuss the implications of *karez* damage or modification by military forces and introduce the terms *cultural landscape* and *cultural property*. These lay the foundation for the theoretical framework of this research. Next, I present the research objectives and assumptions and discuss the significance of this study. I follow this with a description of remote sensing and library methodologies, a discussion of the research hypotheses, and a discussion of both the broader implications and the limitations of this research. Finally, I provide an outline of the dissertation.

### **1.1 Project Summary**

This research is part of a larger multidisciplinary research project funded by the Army Research Office (ARO) to document and study karez systems in Afghanistan, including their history, distribution, function, and cultural significance. I use an archaeological approach to address anthropological questions. I also use topics and data from political science, urban and rural development studies, and geography. The study focuses on the material record of water use, agriculture, and settlements and what these reveal about human experience and alteration of cultural landscapes. Few data exist on the karez and the diffusion of this technology into the region, particularly in Afghanistan. As a result, it was necessary to examine the available literature and discuss the probable diffusion of the karez from Persia to Afghanistan. I suspect this happened in two waves, first during the Achaemenid Period and then again in the 7<sup>th</sup> and 8<sup>th</sup> centuries with the invasion of the Arabs and the expansion of Islam. This research focuses on explaining the specific relationships between karez and people in

Kandahar province, Afghanistan, while also demonstrating the use of remote sensing technologies for the identification of archaeological remains and the protection of cultural property. My study will contribute to the knowledge of the archaeological inventory of Maywand District in Kandahar province through understanding the signatures of cultural property in remotely-sensed data that can document the locations of archaeological and historic features and how these are used. Current academic knowledge of karez systems for Central Asia comes from water-related studies (Hussain, et al. 2008; Kakar 2011; Qureshi 2002; Rout 2008). However, by comparison with other studies conducted in other countries of the Middle East and Central Asia, few historical and archaeological data are available for karez in Afghanistan.

A karez is a traditional system of water management in arid regions that taps into the water table using tunnels that make use of freatic pressure in alluvium to collect and transport water. These systems move water through both subsurface tunnels and surface canals to serve settlements and irrigate agricultural fields (Figure 1). Karez exist in 38 countries, including Central Asia and China, but are primarily concentrated in the Middle East. They appear with greatest frequency in and near Iran (Lightfoot 2009: 3). They are known by many names: *kārīz* (or *kārēz*) in Iran, Afghanistan, and Pakistan; *qanāt* in Iran, Syria and Jordan; *kahan* or *khattara* in Morocco; *galeria* in Spain; *falaj* in United Arab Emirates and Oman; *kahn* in Baloch; and *foggara* or *fughara* in North Africa. Karez were first used in Iran over 2,500 years ago. In Afghanistan, karez have been subjected to alteration or even destruction by successive military actions throughout history. They suffered damage during Russian occupations in the 1970s and 1980s and after 2001 have been affected by actions of the U.S. military,

including base expansions (Fipps 2006; Phillips 2009), and in various direct and indirect efforts to defeat the Taliban and support a stable government (Kelso 2001). The karez represent heritage that should be protected.

This research demonstrates that karez systems have long been an integral part of the cultural landscape of southern Afghanistan.<sup>1</sup> This concept has been discussed in detail by a number of scholars in an edited volume by Knapp and Ashmore (1999) and the term has been formally defined by United Nations Educational, Scientific, and Cultural Organization (UNESCO). The UNESCO definition is central to cultural property decisions (Knapp 1999: 230; Knapp and Ashmore 1999: 9-10,11) and therefore helps to structure my own approach to cultural property protection and preservation.

## **1.2 A Brief History of Cultural Heritage Protection**

The need for formal protection of cultural property during times of conflict is not a new concept. The protection of cultural property dates back to 1863; however, foundations were laid earlier. The concept of a 'just war' originated in the 16<sup>th</sup> and later centuries, followed by the 18<sup>th</sup> century Enlightenment, both of which played a role in the protection of artistic works (Gerstenblith 2010: 5). In *The Law of Nations* (1758), Swiss jurist, philosopher and legal expert Emmerich de Vattel expressed the notion that the appreciation of art and architecture brought people together. In the 19<sup>th</sup> century, Napoleon Bonaparte appropriated art and other items of cultural property during his military campaigns throughout Europe and Egypt. However, the Duke of Wellington of England refused to loot cultural property from France following Napoleon's defeat (Gerstenblith 2006: 253; 2010: 5). Under the request of President Abraham Lincoln,

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<sup>1</sup> Definitions on the terms "landscape" and "cultural landscape" vary among and within disciplines. A broader discussion can be found on pages 31-32.

Francis Lieber drafted the *Instructions for the Government of Armies of the United States in the Field* (1863), also called the Lieber Code, as a code of conduct for the United States to use during the Civil War (Gerstenblith 2010: 5-6). According to this code, “charitable institutions, scientific collections and works of art” were to receive special treatment during the war<sup>2</sup> (Gerstenblith 2006: 253-254; 2010: 5-6). The first international treaties, the 1899 and 1907 *Hague Conventions with Respect to the Laws and Customs of War on Land*, utilized principles put forth by the Lieber Code to include provisions in the protection of cultural property<sup>3</sup> (Gerstenblith 2006: 255; 2010: 6). The term cultural property refers to “objects of artistic, archaeological, ethnological or historical interest [that are] components of a common human culture...” (Merryman 1986: 831). Kila (2010: 43) notes that the terms cultural property, cultural resources, and cultural awareness are often used interchangeably but that scholars primarily use cultural property because it is the legal term utilized in the 1954 Hague Convention.<sup>4</sup>

On April 15<sup>th</sup>, 1935, the Roerich Pact and Banner of Peace were ratified in a treaty signed by every nation in the Pan-American Union, including the United States. Nicholas Roerich, an artist and amateur archaeologist who had emigrated to the U.S. from Russia developed the pact. He drafted the treaty in the 1920s in response to the Russian Revolution and the destruction of cultural properties during World War I, and his movement for protection of cultural property grew rapidly by the 1930s (Nicholas Roerich Museum 2012). The Roerich Pact included a banner with a symbol that would be “flown at all sites of cultural activity and historical value” and, as such, these sites

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<sup>2</sup> See Gerstenblith 2010:6 for the sections of the Lieber Code relevant to the protection of cultural property.

<sup>3</sup> See Gerstenblith 2010:6-7 for a discussion of the key Articles relevant to the protection of cultural property.

<sup>4</sup> Refer to Kila 2008 page 43 for a larger discussion of these terms.

would be considered neutral, “independent of combatant forces” (Nicholas Roerich Museum 2012). Although the Roerich Pact was based on earlier Hague Conventions (Gerstenblith 2010: 8), signatories to it did not include European nations.

With Axis aggression in Europe and the bombing of Pearl Harbor having just occurred, on December 20<sup>th</sup> 1941, U.S. museum directors and curators met at the Metropolitan Museum of Art in New York to determine the course of action for the security of art objects should conflict break out in the United States (Edsel 2009: 18). In August 1943, as a result of the Harvard Group’s lobbying of the U.S. government, the American Council of Learned Societies, Francis Henry Taylor (Director of the Metropolitan Museum of Art), and William Dinsmoor (President of the Archaeological Institute of America) formed the American Commission for the Protection and Salvage of Artist and Historic Monuments in Europe (Spirydowicz 2010: 15-16). This commission later became the Roberts Commission, including the Monuments, Fine Arts and Archives Section (MFA&A). General Dwight Eisenhower declared that cultural property was only to be destroyed in cases of military necessity (Edsel 2009: 45-46; Gerstenblith 2006: 258). The 1944 bombing by Western Allied Forces of Monte Cassino, a church and monastery in Italy founded by Saint Benedict (ca. AD 529), illustrated how military assistance was needed to protect cultural property during the war (Edsel 2009: 45-46).

The *1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict*<sup>5</sup> was the “first international convention to exclusively address cultural property” among the international humanitarian conventions that followed World War II

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<sup>5</sup> Refer to Gerstenblith 2010:8-11 for a larger discussion on the 1954 Hague Convention and its protocols.

(Gerstenblith 2010: 8). Gerstenblith (2010: 9) notes that, while the United Kingdom and the United States signed the main convention, it remained unratified at the time of the 2003 Gulf War. Ratification was delayed because its First Protocol addresses the responsibility of occupying powers to prevent the exportation of cultural property and mandates that cultural property taken for safeguarding by occupying powers should be returned after conflict ends; it was not popular among nations with major art markets and art interest lobbyists (Gerstenblith 2006: 266; 2010: 8). Although there were 114 parties in the main Convention, as of 2006, only 92 had ratified the First Protocol. The United States is not one of the First Protocol signers (Gerstenblith 2006: 266).

In 1996, the International Committee of the Blue Shield (ICBS) was formed by four non-governmental organizations (NGOs): the International Council on Archives (ICA), the International Council of Museums (ICOM), the International Council on Monuments and Sites (ICOMOS), and the International Federation of Library Associations and Institutions (IFLA) (ICOM 2010; USCBS 2010). The ICBS has been described as “the cultural equivalent of the Red Cross” (ICOM 2010). While the organization has many of the same goals of the Roerich Pact, which was ratified only for the Americas, the ICBS has the participation of countries in Europe, Africa, and Asia and has included measures to protect cultural property during times of military conflict. The U.S. Committee of the Blue Shield (USCBS) formed in 2006 as a national organization in the U.S. to support the mission of the ICBS (USCBS 2010).

### **1.3 The U.S. Military’s Role in Cultural Property Protection**

The U.S. military has had a long history of protecting cultural property in times of conflict. A recent edited volume includes articles on the historical and contemporary

efforts of the U.S. military in protecting cultural property. I will discuss the educational and training programs implemented by the U.S. military to protect cultural property in Chapter 10 because these efforts are important to create a model for cultural property protection during conflict.

*Archaeology, Cultural Property and the Military* (Rush 2010a) is an in-depth edited volume that provides information on both the historical and contemporary programs and efforts by the military to protect cultural property during conflict. It includes articles on the legal framework for cultural property protection during conflict (Gerstenblith 2010) and reprints the first two Protocols of the 1954 Hague Convention, discusses the historical efforts of the Monuments Officers in WWII (Spirydowicz 2010) and the historical and contemporary role of U.S. Army Civil Affairs (Wegnener 2010). It discusses recent education and protection programs and organizations in Afghanistan and Iraq (Green 2010; Rush 2010b, c; Siebrandt 2010; Zeidler and Rush 2010) as well as the experiences, roles, and educational programs of Austrian and Swiss armed forces (Radcliffe 2010; Schipper, et al. 2010; Zellmeyer 2010).

There are two known instances of unintentional karez modification by U.S. military forces. The inadvertent alteration of karez systems was brought to the attention of the public in a newspaper article (Phillips 2009). It has also been discussed in association with the rehabilitation of another system (Fipps 2006) and the closing of karez shafts at the Bagram air base (Tanha 2010). When the alteration of karez systems occurs, unnecessary tension can result. As seen in the case of the Bagram air base, closing karez shafts could result in flooding and thereby damaging homes and villages (Tanha 2010). Karez loss threatens the livelihoods of the local communities

and can not only change the social structure of village, but it can alter livelihoods, forcing villagers to seek other sources of employment. Some alternative livelihoods, such as opium poppy cultivation, contribute to the continued instability in Afghanistan. Karez modification or destruction alters the cultural landscape and ultimately could result in a loss of cultural property.

#### **1.4 Cultural Landscape and Cultural Property**

UNESCO (2008: 85) defines *cultural landscape* as “cultural properties” that “represent the combined works of nature and of man.” Furthermore, cultural landscapes are:

illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal (UNESCO 2008: 85).

UNESCO further divides cultural landscapes into three categories: **defined**, **evolved**, and **associative**. A **defined cultural landscape**, also referred to as a *clearly defined landscape*, is “designed and created intentionally by a single person or a group” and includes “garden and parkland landscapes constructed for aesthetic reasons” which may or may not be associated with religious or monumental buildings (UNESCO 2008). An **evolved cultural landscape**, also referred to as an *organically evolved landscape*, is defined as resulting from “an initial social, economic, administrative, and/or religious imperative and has developed its present form by association with and in response to its natural environment.” This type of landscape can continue to “evolve

as a living place or the evolutionary process has ceased and the landscape is in remnant form” (UNESCO 2008). An **associative cultural landscape** is one that is associated with cultural traditions in that the “landscape is the physical place where intangible aspects of cultural property are embodied” (UNESCO 2008). These categories will be important in testing at what level(s) karez represent cultural property in southern Afghanistan.

## **1.5 Introduction to the Theoretical Framework & Methodology**

Landscape archaeology is the theoretical foundation for this research and landscape approaches are central to understanding the relationships of archaeological features, water, and culture in southern Afghanistan. Landscape archaeology is a collection of theoretical constructs that vary among archaeologists.

Varying definitions exist for the term “landscape” and the theory of landscape archaeology lacks cohesion. Therefore, in this research I use definitions and concepts that are most useful to my research and are widely accepted by scholars. In its simplest form, “landscape” is defined as a context for the spatial relationship between humans and their environment (Crumley and Marquardt 1990:73) while theories of landscape archaeology focus on the landscape as well as interrelationships among multiple sites and the geographical spaces among them (Chapman 2006:11).

Theoretical considerations for this research come from the work of Knapp and Ashmore. I use their four themes to interpret the archaeological record from a landscape perspective. These themes are: 1) landscape as memory, 2) landscape as identity, 3) landscape as social order, and 4) landscape as transformation (Knapp and Ashmore 1999: 13). I present four landscape concepts, *ethnoscape* (Appadurai 1996),

*taskscape* (Ingold 1993), *heritage-scape*<sup>6</sup> (Di Giovine 2009), and *archaeoscape* (Parks 2010) and apply them to interpretations of the cultural landscape of southern Afghanistan.

## 1.6 Research Objectives

My research will use specific remote sensing technologies and a geographic information system (GIS) to map cultural and natural resources and test the utility of these technologies for interpreting the roles of karez, both ancient and modern, in the contexts of human settlements. My principal objective is to identify specific factors in cultural landscape evolution (discussed in detail below) that have affected karez construction, use, and abandonment so as to anticipate and seek resolutions to human problems that derive from water availability and use. In addition to this principal objective, I will: 1) test the utility of several different remote sensing technologies for identifying specific above-ground architectural features in arid environments of southern Afghanistan; 2) define cultural landscape change over time in Kandahar province with a particular focus on settlement and karez expansion and/or abandonment; 3) explain the effects (both positive and negative) of the destruction or disuse of karez systems on modern settlements and social structure, and 4) suggest models for the protection, conservation, rehabilitation, and construction of karez systems that will benefit people of the region in various ways. This latter goal will be undertaken using the anthropological paradigm of **appropriate technology**.

I define *remote sensing technologies* as both airborne and satellite imagery. For this study, remote sensing technologies will include Corona imagery from the 1980s,

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<sup>6</sup> As coined by Di Giovine (2009).

orthorectified aerial photography acquired through the United States Army Geospatial Center (USAGC) from 2008, LiDAR data acquired through the USAGC in 2008, and Landsat imagery from 2010 and 2011.

I define *cultural resources* as archaeological remains, taking into consideration the archaeological aspects of both modern (currently occupied) and relict (abandoned) villages in addition to karez systems. I define *natural resources* to include non-culturally generated features in the physical environment, such as rivers and soils.

## **1.7 Research Assumptions**

Due to the number of limitations (discussed below) in conducting this research, I am working with the following assumptions: 1) that the karez is an environmentally and economically appropriate technology (Lightfoot 2009: 6) and 2) that the karez is part of social networks within the community (Hussain, et al. 2008: 337; Kakar 2011: 11-13). The term “appropriate technology” is defined as “being small scale, energy efficient, environmentally sound, labor-intensive, and controlled by the local community” (Hazeltine and Bull 1999: 3; Office of Technology Assessment 1981: 3). Appropriate technology can be characterized as a modern movement having origins that date back to the 1960s and that stem from the work of British economist, E. F. Schumacher (Hazeltine and Bull 1999: 4; Office of Technology Assessment 1981: 3, 17-18). Schumacher found that when capital-intensive types of technology utilized in industrialized societies were introduced to developing nations that more social and economic problems were created than were solved. As a result, Schumacher proposed the concept of “intermediate technology” meaning that the technology “is far more productive than traditional methods, but still more labor intensive and less capital

intensive” than those utilized by industrialized societies (Office of Technology Assessment 1981: 17). As noted above, karez are labor intensive and costly; however, karez technology does not deplete water resources, as do deep wells with mechanized pumps.

When the karez can no longer provide sufficiently for the community, individuals seek employment outside of the community. In so doing, they alter social relationships and the karez is no longer “the tie that binds.” While there is often conflict within the village regarding the karez, water rights, and timeshares, the karez makes people work together, lessening the notion of the individual and individual needs. The karez creates bonds both within and outside of the community (Kakar 2011: 11-13). So when a karez dies, these bonds with neighboring villages and semi-sedentary people, who rely on the villages for water and supplies, also change.

## **1.8 Research Significance**

My research is intended to demonstrate that remote sensing techniques can be utilized to identify, in a provisional but effective fashion, cultural property on a landscape—the material correlates of cultural landscapes—without the necessity of being on the ground. Ground-truthing is necessary in archaeology and remote sensing (Crutchley 2006; Gallagher and Josephs 2008), but when the objective is to avoid damaging items of cultural property during conflict, remote sensing is the best available tool for identifying these features. Unfortunately, only those features large enough to be detected in the imagery will be found. This excludes many archaeological remains, especially those pertaining to the Paleolithic period, buried remains from later periods, and others that did not result in recognizable above-ground features. By understanding

the locations of items of cultural property, they are less likely to be destroyed during occupation and conflict resulting from bombing, construction, looting, and other destructive activities.

Conducting a cultural landscape study utilizing time sequenced imagery successfully demonstrates that remote sensing technologies can be used to map and understand the cultural landscape in southern Afghanistan and that the imagery illustrates the spatial distribution of settlements and water use including communities utilizing mechanized pumps and those that rely on karez water.

I will argue that the karez is not only a sustainable and renewable source of water in an arid environment (Lightfoot 2009: 6; Snee 2007; Wessels 2008: 12), but that this technology is part of the cultural landscape of the region and should be protected, preserved, and revitalized for four reasons. First, karez represent a remarkable technology created to overcome adverse environmental conditions and to facilitate both agriculture and settled life in the region dating between the 10<sup>th</sup> and 8<sup>th</sup> centuries BC (Kobori 1973: 215; Lightfoot 2000: 217-218). Second, once karez are constructed they are relatively affordable to maintain—the maintenance fees are dispersed to respective users within the community; whereas, mechanized pumps use diesel fuel, and mechanical parts for pump maintenance can both be costly in comparison to wages earned in rural villages.

Third, in determining the rate of landscape evolution with regard to settlements and karez systems, we may be able to predict loss (if any) of karez systems in the future. These traditional water systems are not only threatened by lack of maintenance and lowered water tables from drought (Kakar 2011: 4; Lightfoot 2009: 24; Snee 2007:

3), but by military construction (Fipps 2006; Phillips 2009) and other activity (Contreras 2010; Contreras and Brodie 2010; Hritz 2008; Stone 2008). Because they are subterranean tunnels, abandoned karez are places where the Taliban can store weapons, and, as such, they have been damaged or destroyed by the U.S. military (Kelso 2001). Additionally, with massive abandonment or destruction of the karez, there is also a loss of intangible culture—indigenous knowledge on how to construct these features, in addition to the oral histories and memories on their use and construction.

## **1.9 Research Methods**

This research will utilize both remote sensing and library research. Remote sensing methods will focus on the use of orthorectified aerial photography (USAGC 2008b), Corona high-resolution aerial photography (USEROS 1980), Landsat 5 Thematic Mapper (TM), and LiDAR data (USAGC 2008a). Library resources consist primarily of the Archaeological Gazetteer of Afghanistan (Ball 1982) and other relevant literature, including books, book chapters, and articles.

### **1.9.a Remote Sensing Methods**

My research will use various remote sensing technologies including LiDAR, Landsat, and both Corona and orthorectified aerial photography. A principal objective will be to test not only the utility of these methods to identify archaeological remains but to study cultural landscape evolution as affected by environmental factors (Parcak 2007) and human modification (Contreras 2010; Contreras and Brodie 2010; Hritz 2008; Lightfoot and Miller 1996; Stone 2008). Light Detection and Ranging (LiDAR) has

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<sup>7</sup> Historically, both local residents and Mujahideen used karezes during the Soviet occupation (Grau and Jalali 1998).

proven to be a valuable technology in archaeological research in the last decade as demonstrated by its use in several projects in Mesoamerica (Chase, et al. 2011), North America (Gallagher and Josephs 2008; Harmon, et al. 2006), and Europe (Bewley, et al. 2005; Crutchley 2006; Deveraux, et al. 2005). The use of LiDAR to map topographic highs and lows on the landscape make it possible to discern various kinds of architectural features. Orthorectified aerial photography with similar resolution can complement the LiDAR data. Landsat imagery provides lower resolution imagery but does so by separating out bandwidths (such as red, green, blue, and infrared) that permit analyses not possible with either LiDAR or aerial photography.

#### **1.9.a.1 Normalized Difference Vegetation Index**

Normalized Difference Vegetation Index (NDVI) combines the infrared and red bands in a normalized ratio to measure vegetation vigor, which is associated with plant health. The presence of buried archaeological features can also affect how vegetation grows and its health (Parcak 2009: 92); therefore, the presence or absence of vegetation or changes in vegetation can be an indication of buried archaeological features. The formula

$$\text{NDVI} = (\text{NIR} - \text{Red}) / (\text{NIR} + \text{red})$$

produces a number ranging from -1 to 1. Values closer to 1 indicate the presence of vigorous green vegetation, while values closer to -1 indicate the landscape is closer to barren (Parcak 2009: 92). However, ArcGIS utilizes a formula to produce only positive values

$$\text{NDVI} = ((\text{NIR} - \text{Red}) / (\text{NIR} + \text{red})) * 100 + 100$$

and produces a number ranging from 0 to 255, where values closer to 255 indicates vegetation vigor while values closer to 0 indicate a landscape closer to barren.

### **1.9.b Library Methods and Analysis**

An extensive review of the archaeological and anthropological literature will clarify the nature and extent of both archaeological remains and current settlements. Site plans and maps will help identify and provide an approximate age for features evident in the remotely-sensed data. Warwick Ball's (1982) archaeological gazetteer serves as a starting point to identify the known archaeological remains on the landscape and research conducted at the sites in southern Afghanistan. Literature focusing on the karez, its importance in providing water to settlements in an arid context, and its history, diffusion, and current threats will contribute to an overall model of cultural landscape change.

Data on the architecture and archaeology of Afghanistan will come from a variety of sources: a gazetteer (Ball 1982); books (Allchin and Hammond 1978; Ball 2008; Coon 1957; Knobloch 2002); articles (Coon and Ralph 1955; Dales 1972; Davis and Dupree 1977; Dupree 1960; Dupree, et al. 1972; Dupree and Howe 1963; Dupree, et al. 1970; Knobloch 1981), to name a few. I will also use ethnographic data from traveler's accounts (Fox 1943; Matheson 1982) and water, agriculture, and development reports (Grace 2004; Kakar 2011; Pain 2010; Pain and Kantor 2010) to name a few.

### **1.9.c Laboratory Methods and Analysis**

I will use the following data resources in my analysis: high-resolution aerial photography, such as Corona (USEROS 1980) and orthorectified imagery (USAGC

2008b), LiDAR data (USAGC 2008a), and satellite imagery (i.e., Landsat), and, when available, ethnographic data and ground-verification of features.

I will use older imagery, such as Corona, to create older maps of both currently documented and previously undocumented archaeological features. I will seek assistance in ground-truthing sites when independent confirmation of archaeological features is not available.

As for the testing of Hypothesis 1, older imagery will be used to create older maps of these settlements. A comparison of data created from older and newer maps will determine the rate of expansion or decline, if any, in settlements and karez systems. Impact will be determined by measuring the area in GIS of the features.

I conducted an initial study to test the utility of the LiDAR data and orthorectified aerial photography for the identification of archaeological features. I created a hillshade model from the LiDAR data using ArcGIS 10 and identified a total of 90 possible archaeological features. By comparing the hillshade with the orthorectified imagery, I demonstrated that large features, such as mounds, are visible in both data sets. Agricultural fields situated within the study area generally avoid rises in topography. As a result, fields are cultivated around elevated areas, such as mound features, which makes it easier to locate possible archaeological features (Figure 2).

While Google Earth imagery is a good starting point for archaeological fieldwork, and several scholars have utilized it for archaeological research (Contreras and Brodie 2010; Kennedy and Bishop 2011; Myers 2010; Thomas, et al. 2008), a comparison of Google Earth and the orthorectified imagery demonstrated the superior quality of spatial resolution in the orthorectified imagery (Figure 3). This raised concern that the spatial

resolution of Google Earth was insufficient for identifying and mapping small features, such as mounds and structures.

### **1.10 Broader Implications**

There are four categories within which we can identify broader implications of this study: 1) its significance to the field of anthropology, 2) its significance for cooperation between military officials and academics, 3) its significance to understanding and promoting appropriate technology, and 4) its significance for understanding water and food security not only in Afghanistan but other parts of the world.

In the first category, this case study of karez use provides an example of practical applications of anthropological and archaeological methodology. Understanding cultural adaptations, social systems, and the meaning of water in southern Afghanistan provides a foundation not only to protect and revitalize the karez, but also to determine how and in what form aid should take in order to rebuild, revitalize, and sustain karez-based villages. From a perspective of concerns with cultural evolution and cultural ecology, the karez is one way that people adapted to the arid environment in southern Afghanistan. Long-term settlements would not exist in southern Afghanistan or other parts of Central Asia and the Middle East if it were not for the ability to divert the flow of rivers via canals or karezes (English 1966: 30; Frye 1996: 13). Laws and regulations concerning water management influence the relationships between water and community and vice versa. Insights into water management and karez irrigation provide insights into social and political organization (Scarborough 2003: 2). Studying landscape change and the rate and processes of change, as Scarborough

(2003: 10) notes, enables us to “achieve a fresh view of social complexity” in southern Afghanistan.

In the second category, the question of whether academics should work with the military has been a much-debated topic. It is my intent that this study demonstrates the necessity for academics and military officials to work together to protect and understand the karez as items of cultural property not only important as a human constructed technological advancement in an adverse climate, but their significance to the people of the region historically. For the residents of southern Afghanistan, it is important to understand the correlation between the karez and both human and settlement survival and its impact on the formation of social structure in southern Kandahar.

In the third category, the karez is an environmentally appropriate technology for water management in an arid environment. It is used in 38 other countries besides Afghanistan. Since this form of technology provides water in a renewable and sustainable manner, its relevance and cultural significance to Afghanistan could demonstrate that it is an appropriate technology that can be useful to address water access issues—especially in arid regions—outside of the Middle East and Central Asia. However, while this technology may be appropriate and sustainable, it may be rejected because communities may want a more “modern” technology, such as wells with mechanized pumping, regardless of the environmental and economical costs. Could this form of technology be utilized to address water management issues in the American Southwest or in other arid regions of North America? We know this form of technology exists in Mexico (Barnes and Fleming 1991: 49). Would other North Americans accept this technology? Or would this type of technology best serve rural environments in

developing countries in regions where it is not yet used? Demonstrating the effectiveness of the karez and the communal ties that result from village cooperation may prove to be an effective way to not only bring water to villages in other parts of the world, but also to create cooperation within the village and among villages in the regions (Kakar 2011: 10; Mohyuddin and Chaudhry 2012: 135; Mohyuddin, et al. 2012b: 143).

In the fourth category, it should be self-evident that water is essential for food security. Irrigation facilitates food production and the possibility of double-cropping. Food and food security is especially important in Afghanistan, a country where approximately 36% of the population is classified as poor and 80% live below the poverty line (Hanasz 2011: 2; The World Bank 2010: 77). Furthermore, extreme weather (i.e., prolonged drought<sup>8</sup> or excessive snowfall), three decades of nearly continuous war, and minimal economic development have no doubt played a role in food insecurity.<sup>9</sup> Estimates from 2011 show that the northeastern, central, and southern portions of Afghanistan experienced moderate food insecurity on a scale that ranged from “no acute food insecurity” to “famine” (Hanasz 2011: 2). The current estimated food security outcomes for April through June 2012 in Kandahar is “none or minimal acute food insecurity” (USAID 2012: 3); although actual levels of insecurity will vary depending on rainfall received and pasture conditions (FEWS NET 2011: 28). Additionally, food security will play a role in rebuilding both local communities and the

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<sup>8</sup> Prolonged droughts have occurred in Afghanistan in the late 1960s, mid-1980s, and between 1999 and 2005 (United Nations Environmental Programme 2003, 2006; Whitney 2006:19). Snee (2007:3) notes that drought from 1999 to 2001 compounded with lack of maintenance and the digging of wells, contributed karez failure in Kandahar.

<sup>9</sup> With regard to rural populations in Kandahar, conflict, and food insecurity, an Afghanistan Food Security Outlook Update issued by USAID in September 2011 notes “no evidence that the current situation, as it has evolved through the years, poses ongoing hazards that can risk acute food insecurity. The population has obviously adapted, but remains vulnerable to dramatic shifts in security” (USAID 2011a:4).

state—Hanasz (2011: 1) notes, “access to staples and a level of basic nutrition has profound flow-on effects for the cohesion, strength, and development of the population.” Understanding the karez in Afghanistan provides insight into potential solutions for water scarcity in other arid and impoverished regions of the world.

## **1.11 Hypotheses**

In addition to pursuing the several goals identified above, I propose to test six hypotheses that focus on identifying archaeological remains and changes in cultural landscapes over time:

**Hypothesis 1: Remotely-sensed data can be used to identify both documented and previously undocumented archaeological sites and to map these features.**

I will test this hypothesis by using LiDAR data (USAGC 2008a) and orthorectified aerial photography (USAGC 2008b) with a GIS layer of previously documented archaeological sites to tentatively identify undocumented sites and to map specific architectural features.

**Hypothesis 2: There is a pattern in cultural landscape change over time that demonstrates a decline in karez use.**

Decline can be identified from changing settlement patterns using time sequenced remotely-sensed data for changes that occurred after the 1960s. I expect to find the following indicators of cultural landscape change in: 1) abandonment of the karez as indicated by a system that appears to be relict because vertical access shafts

are filled in and 2) the abandonment of the entire settlement as demonstrated by fallow fields and architectural remains of households in which the roofs are clearly collapsed (Figure 4).

An additional hypothesis regarding the determination of whether a karez is active or inactive is proposed:

**Hypothesis 2a: NDVI can be used to determine whether a karez is active.**

Using Landsat data, NDVI analysis, and known locations of karez systems both active and inactive, I expect that the active systems will have positive NDVI values while inactive systems will have lesser or negative values.

**Hypothesis 3: Karez represent cultural property at local, national, and world levels.**

The use of karez dates back to the 6<sup>th</sup> century BC in the region, and as such, the karez may represent cultural property. However, while on a global scale this technology may represent cultural property, it may not be defined as such at the local or national level. This research will explore the importance of traditional water systems (i.e., karez, qanat, khettera, etc.) in local communities, the region, and on a global scale to determine if an argument, and at what level, can be made that these systems are cultural property. UNESCO's definitions of cultural property (refer to pages 7-8) will be important in testing at what level(s) karez represent cultural property in southern Afghanistan.

**Hypothesis 4: The karez can be used to evaluate the presence of social hierarchies and/or heterarchies.**

Looking to Kirman City in Iran, English (1966: 50) notes that household location and proximity to the qanat (i.e., karez) watercourse is determined based on “social and economic status” and those residents receive cleaner and more plentiful water, whereas those residents located downstream are poorer and receive water that is less in volume and more polluted. The qanats in Iran were often built by one powerful individual; however, constant maintenance of the system necessitated selling of shares (English 1968: 179). While this example, and the settlement distribution along the watercourse from Kirman, Iran (English 1966: 50), suggests a hierarchical form of social organization, a heterarchical social system should not be discounted. Scarborough (2003: 12) notes that while periods of centralization may exist, such that would be necessary to construct a karez, a heterarchical model “entails cooperation and resiliency within a densely populated hinterland.” Unfortunately, social organization in the villages of southern Afghanistan may not be possible to infer based solely on remotely-sensed imagery. While other forms of social organization, such as heterarchies, may be present in villages utilizing karez technology, this type of research has not yet been conducted for Afghanistan. The work of Carole Crumley (1995a, b) and heterarchy as a form of social organization in the Maywand study area and southern Afghanistan will be explored in this research.

**Hypothesis 5: Cultural landscape change is reflected in changing patterns of karez use by associated communities.**

Knapp and Ashmore's (1999:13) four themes relevant to the study of archaeology from a landscape perspective help to understand the landscape of southern Afghanistan in human terms. These themes are identifiable in the remotely-sensed imagery. Individuals associate memories, including the construction or maintenance of a karez, with a given locale or landscape. Arrangements of agricultural fields around mounds or features demonstrate an acknowledgement of those features. As a result, those features become part of the memory of that individual and/or village (refer back to Figure 2). As noted above, the cultural landscape is where people consciously or unconsciously *represent their world*, creating and sustaining identity in so doing. Sustaining identity can be seen in southern Afghanistan in the evolution of the *qala*. Historically a *qala* refers to a self-contained structure that provides "shelter and protection for an extended family, their farm animals, and the provisions necessary for survival" (Szabo and Barfield 1991: 163) (Figure 5). However, contemporary housing structures made of mudbrick are also referred to as *qalas* by scholars (Hallet and Samizay 1980; Szabo and Barfield 1991). These contemporary structures have evolved in style and are smaller and do not contain corner guard towers as is seen with historic *qala* fortresses. Landscape as social order is seen in the way the landscape is socially constructed, which, in turn, affects the ways cultural relations are ordered (Knapp and Ashmore 1999: 14-17). Lastly, the cultural landscape can be thought of in terms of transformation. As there is a perception or a change in the social order so too does the landscape undergo a transformation (Knapp and Ashmore 1999: 17-18). Landscape change, and its transformation, also alters perception. Transformation can be demonstrated in my research through the reuse of older structures for modern

purposes or in scars left on the landscape by inactive karez systems (Figure 6), some of which are repurposed. My research will explore these concepts as part of a methodology by which cultural landscape change can be understood.

## **1.12 Limitations**

As noted above, due to the current political climate and violent military engagements, it is difficult, dangerous, and often impossible to gather ethnographic and archaeological data on the ground. In this situation, remotely-sensed data, such as aerial photography and known ethnographic and archaeological data will provide information on previously undocumented archaeological sites, landscape changes over time, and the rate of decline in the karez system. However, these methods pose several challenges. First, it is difficult to date architectural remains solely through remotely-sensed imagery because finer architectural features (e.g., columns, tiles, artwork) cannot be seen in the imagery. As a result, architectural remains will be placed in large temporal brackets. Whereas, material remains such as pottery, coins, and metals would assist in a tighter temporal affiliation.

Second, not all archaeological sites contain architecture that can be seen in the remotely-sensed data. A temporary camp that leaves no scars on the landscape, but leaves behind ceramic sherds, will not be detected in a visual analysis of the remotely-sensed imagery. The only way these non-architectural sites can be discovered is through an extensive pedestrian (i.e., on-the-ground) survey. The inability to work on the ground presents a bias to detecting only those features that leave a spectral signature in the remotely-sensed data and as such, will result in gaps in our data on settlement patterns. This gap will further lead to some difficulties in the interpretation of

land use. However, a variety of data sources can help fill in these gaps and provide some verification of features.

### **1.13 Outline of the Study**

The dissertation will follow the following organizational structure:

**Chapter One** introduces the project, the geographical location of the study area, and its goals, both specific and broad. It reviews and discusses the U.S. military's role in the preservation of cultural property, examining lessons learned from Babylon and other specific case studies. It also evaluates implications of the recent alteration of karez systems in the construction of military bases in Afghanistan. It also provides a brief introduction to the theoretical framework and methodology that I will be using as well as an overview of the structure of the dissertation.

**Chapter Two** provides an overview of the study area focusing on the physical and cultural geography and the environment. It provides a brief summary of the archaeology as pertinent to the discussion of karez and archaeological features that are associated with these traditional water systems of the archaeology and history of Afghanistan. Finally, it provides an overview of the political history dating from 1893 to the present and discusses the current threats to the cultural property of southern Afghanistan.

**Chapter Three** presents the theoretical considerations of the dissertation, focusing on landscape archaeology and appropriate technology and discussing the significance of study.

**Chapter Four** reviews literature focusing on the karez, focusing on its history, distribution, and significance in human settlements and cultural landscapes.

**Chapter Five** reviews literature focusing on the history of remote sensing in archaeology using specific case studies to demonstrate archaeological applications in an arid environment. It presents the remote sensing methodologies undertaken in my research and discusses the limitations that condition archaeological research in a highly charged political environment.

**Chapter Six** presents the results of the application of specific remote sensing techniques—the use of LiDAR, satellite imagery, and aerial photography—in the identification of archaeological and other remains. It will describe in detail the different kinds of features that can be recognized on the landscape of southern Afghanistan using remote sensing imagery.

**Chapter Seven** discusses the results of the data as they are relevant to identifying and understanding karez. Emphasis is on determining whether karez are active or inactive, their length, and the villages they supply. It discusses the current state of karez in Afghanistan, focusing on its modern threats and the effects, positive and negative, of recent and current activity to the flow of the karez. Finally, this chapter will make recommendations based upon observations regarding landscape change and how this affects resident populations.

**Chapter Eight** discusses the results of the data as they are relevant to understanding village components and interpreting issues of cultural landscape change over time.

**Chapter Nine** presents theoretical interpretations focusing on the significance of the karez and cultural landscape change over time with an emphasis on themes of landscape archaeology and appropriate technology. It discusses the theoretical

interpretations of data derived from remote sensing with a special emphasis on landscape archaeology. I discuss my interpretation that the Afghan landscape represents a palimpsest of archaeological features and karezes in close proximity to one another. I use four landscape concepts: ethno-scape, heritage-scape, taskscape, and archaeoscape to discuss three types of landscapes present within the study area: 1) a landscape of conflict, 2) the Pashtun landscape as social order and identity, and 3) the changing landscapes of Afghanistan. The last 30 years of conflict have both contributed to and destroyed portions of the cultural landscape.

**Chapter Ten** presents conclusions and final considerations, discussing how the results generated can not only provide a foundation for the cooperation of academics and the armed forces of various nations in an effort to preserve cultural property. It will present a model for identifying and preserving cultural property in the context of possible future military occupations. I summarize my results for the hypotheses tested that focus on landscape change over time. I discuss how the results generated can provide a foundation for the cooperation of academics and the armed forces of various nations in an effort to preserve cultural property. I will present my conclusions on the broader implications of this research and why, as Afghanistan enters a reconstruction period, it is important to understand the social organization of Afghanistan to rebuild a cohesive state. Finally, I will discuss the future directions of this research.

## **APPENDICES**

There are three appendices:

**Appendix A** will present a glossary of relevant terms.

**Appendix B** will present data on catalogued karez in the study area in southern  
Afghanistan

**Appendix C** will be a collection of representative images of identified and significant  
archaeological features on the landscape of southern Afghanistan along with  
their descriptions and interpretations.

## **II. CHAPTER TWO**

### **2.1 Introduction**

This chapter describes the study area in Maywand District in the context of an overview of the geography and environment of Afghanistan with an emphasis on Kandahar Province. It presents the cultural geography with particular focus on ethnic groups and the role of women in agriculture. I discuss the physical environment, particularly the physiographic regions and climate, focusing on agricultural crops, rivers, and how groundwater is recharged. This chapter also presents summaries on archaeological periods relevant to this study, discusses current issues relevant to conducting archaeology in southern Afghanistan, and reviews the various impacts of historical events—including warfare—on its cultural property.

### **2.2 The Maywand Study Area**

My research focuses on a study area that measures approximately 19 X 11 km (Figure 7) in Maywand District of Kandahar province. I selected this location because it meets criteria that make it appropriate for testing several hypotheses using different methodologies. The study area contains karez systems, archaeological remains (both documented and undocumented), and clearly defined modern settlements. It was chosen because there exists overlapping data from sources including LiDAR (USAGC 2008a), orthorectified imagery (USAGC 2008b), and archaeological surveys. My research on this area complements related research that William Johnson (KU Dept. of Geography) is conducting in the adjacent basin.

## **2.3 Geography and Environment**

Afghanistan's physical geography is as diverse as its cultural geography. I present the cultural and physical geography taking into account how these two environments condition settlement, the use of land and water, and agricultural production. These topics will lay the foundation for not only understanding the importance of karez use in southern Afghanistan, but also understanding Pashtun culture and why the southern border continues to be disputed (discussed in detail in Chapter Four).

### **2.3.a Cultural Geography**

Afghanistan shares its eastern and southern borders with Pakistan and its western borders with Iran. A small portion of its eastern border is shared with China (refer back to Figure 7). Turkmenistan, Uzbekistan, and Tajikistan border Afghanistan to the north. Afghanistan has a total land area of approximately 652,230 km<sup>2</sup> (CIA 2012b), 80% of which is mountain or desert terrain (Kelley and Bank 2003: 5; Qureshi 2002: 1). The size and distribution of Afghanistan's population has changed significantly within the past century. In the 1950s, Kohzad (1956: 132-133) noted an approximate population of 12 million located in approximately 30,000 scattered villages. Using data from the last official census, begun in 1978 but not completed due to the Soviet invasion (CIA 2012b), Qureshi (2002: 1) noted an approximate population of 20 million, with 16.5 million living in approximately 20,000 dispersed rural village communities. A 2011 population estimate placed it at approximately 29,835,400 (CIA 2012b).

### 2.3.a.1 Ethnic Groups

There are a multitude of different ethnic groups situated within Afghanistan's borders (Figure 8). Barfield (2010: 22-30) states that "there are dozens of ethnic groups" and presents his discussion of them based on group size. Goodson (2001: 14) estimates that there are about 25 different groups based on language and self-definition. Defining ethnic groups is problematic and, as Barfield (2010: 18) stresses, these definitions can be misleading because criteria used to define ethnic groups in one region may not be relevant for another. Tribal groups are those defined by actual or fictive descent from a common ancestor while nontribal groups are defined as those that do not make claims to common ancestry. The Pashtuns are an example of a tribal group in which membership is unilineal and patrilineal, descending from an actual or fictive common ancestor through the male line (Barfield 2010: 22). Barfield (2010: 18) notes that in tribal groups a person's loyalty is first to their kin, then their village, and lastly to their tribe. Other tribal groups include the Uzbeks, Turkmens, Hazaras, Kirghizes, and Aimaqs. The Tajiks are an example of a nontribal group in which membership is not based on original genealogical relationships among members (Barfield 2010: 22).

Afghanistan's ethnic groups can be divided into large, small, and even smaller groups.<sup>10</sup> The five large ethnic groups are the Pashtuns, Tajiks, Hazaras, Uzbeks, and Turkmens (Barfield 2010: 24; Goodson 2001: 14). The Pashtuns are the predominant group in southern Afghanistan and will be the most relevant to my research. In the

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<sup>10</sup> For a larger discussion of ethnic groups in Afghanistan refer to Barfield 2010:31 and Vogelsang 2002

literature, alternative names for the Pashtuns include “Pathans”<sup>11</sup> and “Pukhtuns”<sup>12</sup> (Ahmed 1980; Barth 1969: 117; Hamilton 1906: 263-264; Isby 2010: 25; Mohyuddin, et al. 2012a: 324-325). They are the largest ethnic group in the country—comprising 40% of the total population<sup>13</sup>—and have been the dominant group in government since the mid-eighteenth century (Barfield 2010: 24; Goodson 2001: 14; Vogelsang 2002: 16).

Pashtun groups trace their origin to Qais, a historic lineage founder who is said to have lived during the early Islamic period (Barfield 2010: 24-25; Barth 1969: 119). The descendants of Qais are organized into four lineages (-*zai*, meaning “son’s of,” in Pashto) that are divided into large clans (-*khel*, in Pashto).<sup>14</sup> The four lineages are: the Durrani, said to be descendants of Qais’ first son; the Ghilzais (also Khalji or Ghalji), said to be descendants of Qais’ second son; the Gurghusht, said to be descendants of Qais’ third son; and the Karlanri, said to be descendants of an uncertain adopted child (Barfield 2010: 25). The relative status of these groups is ranked according to the birth order of their ancestors. Durrani Pashtuns dominate the southern part of the country, especially Kandahar and Helmand provinces. Pashtuns affiliated with the Karlanri descent group are concentrated in large populations along the Pakistan side of the border in the Northwest Frontier Province (NWFP) (Barfield 2010: 25).

Islam is the main religion. The Sunni sect, representing 80% of the population, is the largest while the Shia sect are represented by only 19% (CIA 2012b). Non-Muslim

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<sup>11</sup> Mohyuddin and colleagues (2012:325) note that “Pashtoons have descended through Hazrat Khalid Bin Walid” a warrior referred to as Fathayhan (victorious). Over time, the Fathayhan became shortened “to the word Pathan, another term used for Pashtoons”.

<sup>12</sup> Spelling variations also exist for Pashtun and Pukhtun as Pushtun and Pakhtun, respectively (Barth 1969:117; Isby 2010:25). Hamilton (1906:263-264) differentiates between two of the lineages and refers to the Durrani as “Afghans” and the Ghilzai as “Pathans”.

<sup>13</sup> Vogelsang 2002:16 and Ball 2008:28 put this number at 40 to 50%.

<sup>14</sup> See Chapter Four for a larger discussion of Pashtun tribes.

religious groups, including Sikhs and Hindus, account for the remaining 1% (Barfield 2010: 31). Afsar and colleagues (2008: 61) note that at the core of the “Afghan Islamic tradition” consists of pre-Islamic beliefs and Pashtunwali (discussed in detail in Chapter Four) and that the Taliban have further transformed the tradition by imposing an ultraconservative interpretation of Islam.<sup>15</sup>

Relationships among Pashtun groups, their tribal social organization, and their religion with reference to landscape ownership and use and utilization, spiritual importance, and conservation of water are a principal focus of my research. I will use these to construct an anthropological narrative explaining the cultural significance of the landscape and water in southern Afghanistan. My research will strive to provide a clearer picture of social structure and traditional culture in southern Afghanistan with an emphasis on the roles that kinship, descent, gender, and social class play in the definition of cultural landscape and the use of water, especially within karez systems.

### **2.3.b Physical Geography**

Afghanistan is a country with extreme elevations. Traditionally, geographers have divided the country into the following physiographic regions (Bowlby 1978: 19; CIA 2012b): 1) the Amu Darya Valley, 2) Badakshan, 3) Nuristan, 4) Wakan Corridor/Pamir Knot, 5) Turkestan Plain, 6) Northern Mountains and foothills, 7) Central Mountains, 8) Southern Mountains and foothills, 9) the Herat Farah lowlands, 10) the western desert, 11) the southern desert, and 12) the Seistan Basin and the Helmand Valley (Figure 9). However, the physiographic data are rarely presented based on these divisions. For example, Bowlby (1978: 18) simplifies her discussion of the different physiographic

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<sup>15</sup> For more information on the organizational structure of the Taliban see Afsar, et. al 2008.

regions by organizing them into five main types: the high mountains, the mountains and foothills, the plains and lowlands, the Amu Darya and Helmand-Seistan valleys, and the deserts. In describing the physical geography of Afghanistan, I consider 1) the Hindu Kush and prominent ranges and peaks, taking into consideration passes that connect the north with the south, 2) the rivers and valleys, and 3) the deserts, and 4).

At the Pamir 'knot' in the northeast corner of Afghanistan, six mountain ranges converge: the Himalayas, the Karakorums, the Kunlun, the Tianshan, the Pamir, and the Hindu Kush (Ball 2008: 10-11). The Hindu Kush have an average altitude of 4,000 m and run south-southwest from the Pamir Knot, dividing Afghanistan in half (Kohzad 1956: 129). There are several sections to the entire Hindu Kush range; however, Vogelsang (2002: 9) notes that the name Hindu Kush generally applies to the section of mountains situated north of Kabul. Other notable ranges include the Paropamisos and the Kuh-i Baba. The Paropamisos range is situated roughly in the center of the country, runs west to east, and forms a barrier that protects the Amu Darya and its tributaries (Masson 1992: 35). The Kuh-i Baba range is situated to the west of Kabul and its highest peak is Shah Fuladi (5,158 m)<sup>16</sup> (Vogelsang 2002: 7). The two highest peaks in Afghanistan are Tarach Mir (7,708 m) in the Hindu Kush and Noshak (7,485 m) on the border with Pakistan (CIA 2012b). The Salang Pass and Tunnel is the main pass across the Hindu Kush and connects the northern and southern portions of the country (Vogelsang 2002: 7).

The Hindu Kush also divides the country's hydrology in two parts. North of the Hindu Kush the water flows to the Amu Darya River. In the southwest, it flows to the

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<sup>16</sup> Knobloch (2002:14) notes that the Shah Fuladi is 5,143 m.

Helmand River and in the south it flows to the Indus River (Kohzad 1956: 131-132). Afghanistan has six main rivers, most of which originate in the Hindu Kush (Uhl and Tahiri 2003: 4). The Surkhab, or Kunduz, and the Balkhab, flow northward toward the Amu Darya. The Surkhab flows permanently and empties into the Amu Darya (Masson 1992: 36) while the Balkhab evaporates before reaching it (Vogelsang 2002: 8). A portion of the Afghan-Tajik Valley is situated between the Hindu Kush Mountains and the Amu Dara. The Afghan-Tajik Valley is an extension of the Kara Kum Desert (Masson 1992: 36). The Hari-Rud River flows westward past Herat and then empties in the north at the Kara Kum Desert in Turkmenistan. The Herat Valley lies in the Hari-Rud Basin and is an eastward extension of the Gorgan-Mashhad Depressions (Masson 1992: 36). The Helmand River flows through Afghanistan's southwestern deserts and empties into the Seistan Depression (Vogelsang 2002: 8). The Arghandab River is the major river that flows into the Helmand. This occurs near the archaeological site of **BUST**<sup>17</sup> after the river passes through Kandahar city. The Kabul River flows in the opposite direction—eastward—and collects water from a series of tributaries as it flows toward the Indus (Vogelsang 2002: 8-9). The Kabul and Jalalabad basins lie within the Kabul River Valley (Masson 1992: 36). Table 1 illustrates the river basins of Afghanistan, their associated rivers, catchment areas, and storage capacities.

The study area in Maywand District is situated in the Eastern Helmand Basin.<sup>18</sup> The Eastern Helmand Basin measures 72,200 km<sup>2</sup> in area and while it does not include the Registan Desert, it includes the provinces of Ghazni, and parts of Zabul, Kandahar,

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<sup>17</sup> Documented archaeological sites will indicated throughout the text using **BOLD SMALL CAPS**.

<sup>18</sup> The Helmand River Basin is subdivided into two parts: the Eastern Helmand Basin and the Western Helmand Basin (Uhl and Tahiri 2003:21).

Paktya, and Paktika. Principal tributaries include the Ghazni, Tarnak, Arghistan-Lora, and Arghandab (Uhl and Tahiri 2003: 22).

**Table 1. River basins of Afghanistan and their characteristics (Qureshi 2002: 7).**

River Basin	Rivers in Basin	Catchment area (km <sup>2</sup> )	Storage capacity (Billion m <sup>3</sup> )
Amu Darya basin	Wakhan, Kokcha, Kundz, Pamir/Panj Marghab, Shrin Tagab, Sur Pul, Balkh, Kashan, Kushk, Gulran	302,00	24
Helmand River basin	Helmand, Arghandab, Ghazni, Trank, Arghastan, Musa Qala	218,600	6.5
Western rivers basin	Khash, Farharod, Aderskan, Harierod, etc.	85,300	2.5
Kabul/Indus basin	Kabul, Kunar, Alishing, Alegar, Logar, Pangshir, Shutol, Ghorbund, Laghman, Maidan	72,000	22
Total			55

Southern Afghanistan has two deserts: the Registan (Desert of Sand) and Dasht-i Margo (Desert of Death). The Registan is on the eastern bank of the Helmand River and the Dasht-i Margo on its western bank (Ball 2008: 8; Bowlby 1978: 24; Uhl and Tahiri 2003: 5). Both have a sub-tropical desert climate and reed marshes occur on the delta of the Helmand River (Masson 1992: 36).

### **2.3.b.1 Climate**

Afghanistan has a dry continental climate characterized by extreme annual variations in temperature. The mountains and altitude strongly affect the temperature and precipitation in the country. There are four well-defined seasons: winter (January – March), spring (April – June), summer (July – September), and fall (October – December) (Bowlby 1978: 12; Qureshi 2002: 3). Mountainous areas receive large

amounts of snow in the winter, but Jalalabad and Kandahar experience mild winters without snow (Kohzad 1956: 132, 136). Major contrasts in weather exist in the same season for different geographic regions. For example, Kabul can have a snow cover of 40-50 cm when Jalalabad, just five hours away, has green fields and flowers (Kohzad 1956: 136). Roughly 50% of the precipitation occurs during the winter months and is primarily snowfall; 30% occurs during spring (April to June) and 20% occurs during summer and fall (Qureshi 2002:3). Annual evapotranspiration rates during the first two summer months (July and August) are high everywhere, with a daily peak of 6-8 mm. However, during the rest of the year, evapotranspiration rates are “relatively low.” Evapotranspiration rates are 1,000-1,300 mm in the Hindu Kush, between 1,300-1,500 mm in the Northern plains, and up to 1,800 mm in the Southern and Southwestern Plains (Qureshi 2002:4).

### **2.3.b.2 Agriculture**

The World Factbook (CIA 2012b) notes that Afghanistan has 12.13% arable land, of which 0.21% are permanent crops; irrigated land measures approximately 31,990 km<sup>2</sup>. Agricultural crops and data vary throughout Afghanistan; however, The World Factbook (CIA 2012b) notes that agriculture/products are wheat, fruit, nuts, wool, mutton, animal skins (i.e., lamb and sheep) and opium. Also, Afghanistan leads the world in poppy production. Forty percent of the opium produced in the world comes from raw material generated in Helmand province (CIA 2012b; Rubin 2012).

It is difficult to provide precise figures for agricultural production in Afghanistan because, when discussing agriculture in a general sense, researchers often present outdated information. For example, Qureshi (2002: 5) cites production and crop yields

from 1978. However, recent data are provided in reports. *Livelihoods Zoning “Plus” Activity in Afghanistan* (FEWS NET 2011), a USAID report, defines areas based on livelihood, crops, climate, etc. Therefore, based on USAID livelihood zones, Maywand District, where the study area is located, is categorized as “Livelihood Zone 9: Southern Intensive Irrigated Vegetable and Orchard” (FEWS NET 2011:27). The principal crops harvested in this zone, and throughout Kandahar, are poppies<sup>19</sup> (April-May), wheat (May-July), maize (October-November), barley (April-May), pomegranates (August-October), and grapes and melons (June-September) (FEWS NET 2011: 27; USAID 2011: 4).

**Table 2. Climatic zones of Afghanistan (Qureshi 2002: 3).**

<b>Zone</b>	<b>Name</b>	<b>Precip. (mm)</b>	<b>Dry (months)</b>	<b>Frost (months)</b>
1	Badakhshan (without Wakhan)	300 - 800	2 - 6	1 - 9
2	Central and Northern mountains	200 - 600	2 - 9	0 - 8
3	Eastern and Southern mountains	100 - 700	2 - 9	0 - 10
4	Wakhan corridor and Pamir	<100 - 500	2 - 5	5 - 12
5	Turkestan plains	<100 - 400	5 - 8	0 - 2
6	Western and Southwestern lowlands	<100 - 300	6 - 12	0 - 3

Qureshi (2002: 3) notes that while precipitation is “sufficient” in the mountainous zones (zones 1-4), agriculture is limited by the possibility of frost. However, he does not indicate which crops can be grown with this “sufficient” precipitation. In the low-lying regions (zones 5-6), double cropping is possible but agriculture is limited by rainfall and the availability of water from irrigation (Qureshi 2002: 3).

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<sup>19</sup> There was a decrease in the amount (in area) of poppy crops planted in Kandahar in 2011 (USAID 2011a:4).

Irrigation systems, such as karez, are recharged not only by rainfall but also by runoff produced from melting snow in the spring. In Kandahar there are three types of irrigation methods: karez, river, and tubewell. While all three methods are affected by precipitation, karez and river irrigation systems are primarily recharged through snowmelt from the central highlands that generally occurs even in dry years; conversely, tubewell irrigation is primarily affected by fuel prices (USAID 2011: 3).

The geography and climate of Afghanistan are diverse and it is evident that a balance exists between humans and the environment. However, the past 30 years of war and related activity have interrupted this balance to some extent. While the Hindu Kush divides the country in half and isolates the majority of the population from the capital, they are essential for sustaining life in southern Afghanistan. Rain and yearly snowmelt that accumulates in the central mountains recharges karezes. Theoretically, because the environment is so diverse, agricultural and animal husbandry zones also vary, producing items that could be grown in the north and sold in markets in the south and vice versa. However, the problems resulting from geographically isolated populations within the country are compounded by current political insecurity. The lack of economic development that has resulted from three decades of war has imposed further limitations on the country's inhabitants. These factors have prohibited or limited the movement of people and goods, thus affecting seasonal migrations and livelihoods.

Furthermore, the challenges of successful agricultural production in the context of southern Afghanistan's geographic and environmental conditions are exacerbated when people do not have the necessary means to adapt. Refugees, or internally displaced populations (IDPs) fleeing war zones in the southern portion of the country

head northward to refugee camps, such as Nasaji Bagrami Camp in Kabul. At the camps, IDPs face malnutrition, live in hybrid dwellings that consist of part mud-hut and part tent, and lack either heat or electricity during unseasonably cold winter conditions. This is an ongoing problem that plagues the internally displaced populations in Afghanistan during the winter months. Approximately 100 IDPs died due to winter weather in 2012 (Adeel 2013). Children under five years old suffer the most in these camps and it is estimated that one out of every seven children in the Kabul camps will not survive until his or her sixth birthday (Norland 2012a, b, c). IDP camps and deaths caused by winter weather will continue to be an issue until these populations can return to their home villages or are provided with the means to adapt to their new conditions.

## **2.4 The Archaeology of Afghanistan**

Afghanistan has a rich archaeological history resulting from multiple invasions and occupations. This section will provide a brief summary of the archaeology of southern Afghanistan as pertinent to the discussion of karez and archaeological features that are associated with these traditional water systems. The discussion will focus primarily on the Bronze Age (4000 -1500 BC), Iron Age (1500 – 550 BC), Achaemenid period (550 – 330 BC) and the period of time spanning from the Early Islamic Period (AD 900 – 1200) to the Timurid Period (AD 1380 – 1500), episodes during which the most significant karez construction appears to have occurred. The Achaemenid Period (ca. 550 -330 BC), during which Afghanistan became a part of the expanding Persian Empire, is important since it is probable, based on comparative data, that the karez was first introduced in Afghanistan at this time. It is also probable that the Early Islamic Period marks a second wave of diffusion of the karez throughout

Afghanistan (the karez and its diffusion are discussed in detail in Chapter Four). The time from the Early Islamic Period through the Timurid Period provides a foundation necessary for understanding the relationship between archaeology and the karez as well as for interpreting archaeological features on the landscape (Appendix C). While this section does not discuss the prehistoric period (comprising the Paleolithic, Neolithic, and Chalcolithic) of Afghanistan and leaves a gap in the historic period, various scholars provide summaries for these earlier and later periods (Allchin and Hammond 1978; Ball 1982, 2008; Dupree 1973; Knobloch 2002).

#### **2.4.a Bronze Age (4000 – 1500 BC)**

During the Bronze Age, artistic and technological advancements from the Chalcolithic become more sophisticated and refined. This sophistication is seen in pottery kilns, agriculture, and international communication. Pottery at this time is mostly wheel thrown. The decorations on pottery become uniform based on the ceramic remains from southern Afghanistan at the sites of **MUNDIGAK**<sup>20</sup> and **DEH MORASI GHUNDAI**, sites in the northwest in Turkmenistan, and to the southwest in Baluchistan (Ball 2008: 49). Agricultural fields continue to be fed through irrigation but it is at this time that irrigation canals stretch over long distances and include reservoirs (Ball 2008: 49). Monumental buildings are mud-brick constructions situated on high ground as seen at **DASHLI** or on platforms as seen at **MUNDIGAK** (Ball 2008: 49).

Significant archaeological sites dating to the Bronze Age include **GARDAN RIG**, **DAM**, **SHORTUGHAI**, **DASHLI 1 and DASHLI 3**, and **MUNDIGAK**. **GARDAN REG**<sup>21</sup> is located in

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<sup>20</sup> When archaeological sites are discussed in this dissertation, the typeface utilized will be small caps and bold.

<sup>21</sup> Also see Ball 2008:189 for a summary of **GARDAN RIG**.

Afghan Seistan approximately 15 km east of the Iranian border and is a copper smelting and pottery manufacture site<sup>22</sup> which suggests that the area was once a major industrial area covering<sup>23</sup> over 200 km<sup>2</sup> (Dales 1972: 19; Fairservis 1961: 69). Dales (1972: 22) suggests that these objects may be pre-Islamic; however, Ball (2008: 189) notes that there is also Islamic material at the site. Another site located in Afghan Seistan is **DAM**.<sup>24</sup> The site consists of a grave that is situated inside a “crude” mudbrick wall measuring 30 cm tall (Dales 1972: 34). Dales (1972: 31, 36) notes that the grave is “of recent Islamic date” although objects<sup>25</sup> on placed on grave date during the prehistoric and are in a secondary context, meaning that they were brought there from another location.

**SHORTUGHAI**<sup>26</sup> is a site on the Oxus River in Afghanistan located approximately 25 km east of the site of **AĪ KHANOUM**. The site is an excellent example of a tightly knit community with international connections (Ball 2008: 49). This is confirmed by the discovery of Harappan seals, which suggest that items for trade were produced at **SHORTUGHAI** (Knobloch 2002: 74). The site is located near the lapis lazuli mine in Badakshan and believed to be the source of lapis found throughout Middle Asia during the third millennium.

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<sup>22</sup> See Fairservis 1961:67-76 for a larger discussion of the sites and artifacts located within the GARDAN RIG.

<sup>23</sup> Remains of material culture found at the site include lapis lazuli and a soapstone seal, in addition to “pieces of soapstone cups, and pieces of small alabaster vessels” (Dales 1972:22; Fairservis 1961:69).

<sup>24</sup> Also see Ball 2008:181-182 for a summary of DAM.

<sup>25</sup> Objects on the grave at DAM include “pieces of colored stone, a broken china bowl, pieces of corroded copper, glass, a couple of flint blades, and pieces of small alabaster vessels” (Dales 1972:34).

<sup>26</sup> Also see Francfort 1989 for an in depth discussion of the site and the excavations carried out between 1976 and 1979; Ball 2008:265 for a summary on Shortughai.

The site of **DASHLI 1** is located in northern Afghanistan.<sup>27</sup> It was built on a “pre-existing unfortified community” and consists of a rectangular structure with defensive walls and circular towers that are positioned in the corners of the structure (Sarianidi 1976: 50). This site was the first one discovered in which a rectangular structure is combined with circular towers (Sarianidi 1976: 50). Excavation at the site revealed “an unbroken residential area” which, according to Sarianidi (1976: 55), suggests that the fortress was used by an extended family and that **DASHLI 1** housed a few “extended family units related by blood ties.” To arrive at this conclusion, Sarianidi (1976: 54) uses ethnographic analogy noting that fortifications called Kurgancha, which were still in existence at the time of his writing, were similar structures in that they were rectangular with round towers. Furthermore, he notes that structures such as these were intended for “elite families of the local society” (Sarianidi 1976: 54).

The site of **DASHLI 3** is located approximately 3 km from **DASHLI 1**. Sarianidi (1976: 56) describes the site as “consisting of a high hillock and neighboring low portion” that has not been excavated but notes that it is “intended for a secular purpose.” Ball (2008: 102) notes that **DASHLI 3** is significant because it is there that a circular town plan appears. It is probable that the Iranians introduced this circular layout and it is adhered to in later Central Asian towns.

**MUNDIGAK**<sup>28</sup> (Ball no. 743) dates earlier during the Chalcolithic and boasts connections with Iran, Mesopotamia, Turkmenistan, the Oxus and western Baluchistan, Pakistan, and the Indus Valley (Ball 2008: 45). Occupation of **MUNDIGAK** continues into

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<sup>27</sup> Also see Ball 2008:183-186 for a summary on Dashli 1 and Dashli 3.

<sup>28</sup> For more information on this site, refer to Casal 1961 (in French).

the Bronze Age and during the early third millennium, monuments, such as a palace and a temple, and fortifications appear at the site (Ball 2008: 49, 102).

#### **2.4.b Iron Age (1500 – 550 BC)**

Ball (2008: 50-51) notes that, while the transition from the Bronze Age (3000 – 1500 BC) to the Iron Age is smooth, it is not readily apparent in the archaeological record. This results from continued occupation of sites, such as **KANDAHAR** (Ball no. 522, 726) in southern Afghanistan, where early occupations are buried under “meters of urban overlay” (Ball 2008: 51). During the Iron Age, irrigation is more extensive; iron working—which may to some extent have originated in southern India—replaces copper; and there an emergence of urban centers, such as Merv, Samarkand, **BALKH** (Ball no. 98), **KANDAHAR**, and possibly Nishapur (Ball 2008: 51, 52; Frye 1996: 94). Irrigation canals dating to the Iron Age are present on the plain adjacent to the site of **AĪ KHANOUM** (Ball no. 18) (Ball 2008: 148-150)—these canals are probably associated with a separate, later site because **AĪ KHANOUM** itself does not date as early as the Iron Age.

At this time, citadels are constructed on platforms and cities such as Kandahar have well-constructed and prominent ramparts. Ball (2008: 51) suggests that these developments are an indication of centralized rule and the necessity of using architecture for defense on a large-scale. These changes are seen in the archaeological record at **MUNDIGAK** and **KANDAHAR**.<sup>29</sup> While, at the end of the Bronze Age, **MUNDIGAK** experiences a decline, **KANDAHAR** becomes a regional center that is fortified on a large scale (Ball 2008: 56; Knobloch 2002: 73).

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<sup>29</sup> Also see Ball 2008:229-233 for a summary of Kandahar.

#### **2.4.c Achaemenid Empire (550 – 330 BC)**

Several advances occurred under the Iran-based, Achaemenid Persian rule in Central Asia. The Achaemenid Empire has been identified as the first multinational empire (Frye 1996: 95). The Achaemenid period, beginning ca. 550 BC, is described as a time of peace and stability with an increase in settlements, population, and land under irrigation (Frye 1996: 94-95). It is under Achaemenid rule that advances in political organization occur. During this time, economic development is evidenced by the appearance of provincial governments, roads, taxation, and a banking system (Ball 2008: 58; Frye 1996: 92). This period ended when Alexander of Macedonia entered Afghanistan in 330 BC (Dupree 1973: 276) and destroyed the Achaemenid Empire in the late fourth century.

#### **2.4.d Early Islamic (AD 900 – 1200)**

The Early Islamic Period can be divided into three units: Samanid (AD 900-980), Ghaznavid (AD 997 – 1186), and Ghurid (AD 1150 – 1220). Numerous sites date during the Early Islamic Period. These include **BALKH**, **JAM** (Ball no. 468), **HERAT**, **SHAH-I MASHHAD** (Ball no. 1023), **MAZAR-I SHARIF** (Ball no. 716), **CHISHT** (Ball no. 212), **PESHAWARAN** (Ball nos. 544, 638, 702, 810 and 979), **CHEHEL BURJ** (Ball no. 189), **CHIGINI** (Ball nos. 200 and 201), **GARDEZ**, **GHAZNI** (Ball no. 358), **KANDAHAR**, **LASHKARI BAZAAR** (Ball nos. 1499, 662, and 685), **NAD-I ALI**, **SAR-O TAR** (Ball no. 1006), and **KHWAJA SIAH PUSH** (Ball no. 607).

##### **2.4.d.1 Samanid (AD 900 – 980)**

Samanid brothers Nuh and Ahmad b. Asad laid the foundation for the Samanid state. However, their brother, Ismā'il is recognized as the founder (Negmatov 1998:

78). At this time, a cultural renaissance occurred. Economic and cultural development (e.g., agriculture, mining, and crafts) resulted from the unification of Transoxania and Khorasan<sup>30</sup> (Negmatov 1998: 81). In Transoxania and Khorasan Islamic New Persian (Farsi-Dari) literature developed (Negmatov 1998: 77, 91). Burkhana, the capital, became a great Islamic learning center because of the use of the Persian language in the courts and a revitalization of Persian literature (Ball 2008: 90-91). During the 9<sup>th</sup> and 10<sup>th</sup> centuries, the caravan trade was important and major caravan routes passed through Transoxania and Khorasan. As a result, *caravanserais*<sup>31</sup> were established along the roads (Negmatov 1998: 85). At this time, the caravans moved more than luxury items. Goods included utilitarian and craft items, foods, and raw materials for crafts (Negmatov 1998: 85). Wadis, springs, and artificial surface and underground canals provided irrigation water for agriculture. Pre-existing systems continued to function at this time, but new systems were also constructed during the 9<sup>th</sup> and 10<sup>th</sup> centuries (Negmatov 1998: 82).

The Samanids embraced the Turkish slave trade. These slaves were trained as mercenaries and as a result, by the mid-10<sup>th</sup> century, the Samanid army was primarily composed of powerful Turkish mercenaries and the Samanid ruler became a figurehead (Ball 2008: 91-92). A failed *coup d'état* in 961 AD led by Alp Tegin, the head of the Samanid army, prompted Tegin's resettlement in Ghanza a year later (Ball 2008: 92; Fischer 1978). Samanid rule ended when Turks from Central Asia invaded in AD 999 (Ball 2008: 93; Fischer 1978: 302).

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<sup>30</sup> Khorasan was an Iranian Province that included modern-day northeastern Iran, western Afghanistan, and southern Turkmenistan (Subtelny 2007:1).

<sup>31</sup> A caravanserai is a shelter or hostel on a trade route (Knobloch 2002: 57, 169).

#### **2.4.d.2 Saffarids (AD 861-1003)**

The Saffarids rose to power in the end of the 9<sup>th</sup> century in Seistan, ruling over adjacent parts of Afghanistan and Iran (Ball 2008: 90; Knobloch 2002: 30). Ya'qub Ibn Layth, a coppersmith from Iran, founded the Saffarid dynasty at the end of the 9<sup>th</sup> century when he escaped from Baghdad that was under Abbasid Rule (Ball 2008: 90). Although the Saffarids were able to conquer Kabul, their rule there did not last long (Knobloch 2002: 30). In 900 AD the Samanid amirs of Bukhara conquered the Saffarids. However, another part of the Saffarid family was able to resume power until the establishment of the Safavid Empire in the 16<sup>th</sup> century<sup>32</sup> (Knobloch 2002: 30)

#### **2.4.d.3 Ghaznavid (AD 997-1186<sup>33</sup>)**

Fischer (1978: 302) cites Alp Tegin's resettlement in Ghazna (modern day Ghazni) as "the definitive date of Muslim conquest of the region" since Tegin "defeated the native chief and assumed his own base." In 977, Sebuk Tegin, a slave of Alp Tegin, established Ghazna as a kingdom. By 997, Ghazna flourished into a great empire under Sebuk Tegin's son, Sultan Mahmud of Ghazna (Ball 2008: 92). The Ghaznavid Empire abandoned the capital of Ghazna when it was "sacked and burned" by the Ghor Empire in AD 1150 (Knobloch 2002: 30).

Agriculture at this time was small-scale subsistence based primarily for local consumption but also supplemented towns such as Herat, Merv, and Nishapur (Bosworth 1998: 116). Rivers, such as the Oxus, Murghab, and Helmand, contained

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<sup>32</sup> Fischer (1978:359) notes that the Saffarids "ruled independently or as governors and vassals, from 867 until ca. 1495, under the Ghaznavids, Seljuks, Ghorids, Ilkhans and Timurids." The Ilkhans were an Iranian dynasty that ruled from ca. 1256-1353 (Dupree 1973:317).

<sup>33</sup> Ball 1982 places the Ghaznavid Empire from 980 to 1150 AD.

water mills and provided permanent water for the area. Wealthy landowners built karezes that provided irrigation water (Bosworth 1998: 116). Bosworth (1998: 116, 117) notes that sultans were “recorded as responsible for the hydraulic constructions in the region of Ghana” and they used forced labor (*corvées*) to construct palaces. Bosworth (1998: 117) notes “the pattern of despotic power-state introduced by the Ghaznavids became the norm for many of the pre-modern Islamic dynasties.” These despotic conditions introduced by the Ghaznavids suggest a hierarchical form of social organization that was also prevalent during the late 1880s and 1890s.

**LASHKARI BAZAAR** (or “soldier’s bazaar”) is a significant site dating to the Ghaznavid Period<sup>34</sup> (Ball no. 149, 662, and 685). It is situated on the confluence of the Helmand and Arghandab Rivers and has monuments that include Iranian, Central Asian, and Seljuk styles<sup>35</sup> (Fischer 1978: 309). From 1949 to 1952, the Déléation Archéologue Française en Afghanistan (DAFA), under the direction of Schlumberger conducted excavations at the site (Ball 1982: 176). There are indications that one of the palaces had running water. For instance, Fischer (1978: 311) notes that the great hall contained a “rose-petalled basin” that was “fed by a canal running from east to west.” Early in the 11<sup>th</sup> century under the reign of Sultan Mahmud, **LASHKARI BAZAAR** was the winter capital of the Ghaznavid Empire (Ball 2008: 240).

#### **2.4.d.4 Ghurids (AD 1150 – 1220)**

The Shansabanid Dynasty, generally referred to as the “Ghurds” ruled from AD 1150 to 1220 and claim descent from mythical Iranian heroes. The Ghurids were never

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<sup>34</sup> Earlier occupations at **LASHKARI BAZAAR** date to the Achaemenid and Sasanian Periods (Ball 2008:240).

<sup>35</sup> For more information on **LASHKARI BAZAAR** see Schlumberger 1952 and Schlumberger et al. 1978 (both publications are in French).

incorporated into the Ghaznavid Empire due to their principal settlement and inaccessibility in the mountains of Ghur (Ball 2008: 93). During the 12<sup>th</sup> century, the inhabitants of the mountain valleys of Ghur were unified and raids were carried out against the Ghaznavids. The Ghaznavid Empire was destroyed in 1173-1174 by 'Ala' ud-Din, a Ghurid sultan (Ball 2008: 93-94). This is evidenced by a fire at the site of **LASHKARI BAZAAR** as well as a reoccupation and restoration of the site by Ghurid sultans (Fischer 1978).

#### **2.4.e Late Islamic**

During the Late Islamic Period, the Timurid Empire ruled (AD 1380 – 1500) contemporaneously with the Saffarid Empire, which persisted until ca. 1495. In ca. 1220, Genghis Khan expanded out of Mongolia to establish an empire from the China Sea to the Caspian Sea. He is described as “a brutal, brilliant, military tactician on a scraggly Mongol pony” (Dupree 1973: 316). He destroyed irrigation systems and cultivated land (Knobloch 2002: 33), as well as cities throughout western Asia and settlements in Bamiyan, such as **SAR KHOSHAK** (Ball no.1004), **SHAHR-I ZOHAK** (Ball no.1052), and **SHAHR-I GHOLGHOLA** (Ball no. 1042) (Dupree 1973: 316). Following the death of Genghis Khan, his sons and grandsons ruled the region until the arrival of Tamerlane in 1381 (see below). From 1245 until 1381, a Tajik Dynasty ruled in Herat. Late Islamic Period sites include **ANDKHUI**<sup>36</sup> (Ball no. 41), **BALKH**, **MAZAR-I SHARIF**, **KABUL**,

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<sup>36</sup> The site of **ANDKHUI** dates earlier to the Sasanian Period (3<sup>rd</sup> to 7<sup>th</sup> century) and then was reoccupied during the Timurid Period in 1386 and 1472 (Ball 2008:153).

GHAZNI, KANDAHAR, KUHSAN (Ball no. 634), HERAT, ZIYARATGAH (Ball no. 1263), RUSI-GAU, CHEHEL BURJ, PALANGI<sup>37</sup> (Ball no. 792), SAR-O TAR, and QAL'A FATH (Ball no. 842).

### 2.3.e.1 Timurid (AD 1380 – 1500)

Timur-i-lang (or Tamerlane) (ca. 1370-1405) was a Turko-Mongol who claimed descent from Genghis Khan and established an empire from India to Turkey (Dupree 1973: 317). Following his death ca. 1405, his sons and grandsons ruled the empire and by the late 15<sup>th</sup> century Central Asia and northwest Afghanistan experienced another period of cultural renaissance (Dupree 1973: 317). Herat was the capital of “the last great Timurid,” Husain Baiqara<sup>38</sup> (ca. 1470-1506).

Agricultural and architectural achievements occur during this period. Tamerlane constructed monumental gardens early in the Timurid Period (Petruccioli 1997; Subtelny 2007: 130-131). Architectural forms do not change during the Timurid Period and both the dome and the *iwan*<sup>39</sup> continues. The use of double domes becomes common and there is one case—the mausoleum of Gawhar Shad, Herat—that used the triple dome (Knobloch 2002: 67). Husain Baiqara's interests focused on agriculture and irrigation systems (Subtelny 2007: 128), in addition to the continued tradition of constructing gardens. Subtelny (2007: 124) notes that Khorasan agriculture during Baiqara's rule was “an effective combination of state and private investment and small-scale irrigation farming ('hydroagriculture')<sup>40</sup> although large-scale works were also undertaken. Three

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<sup>37</sup> The site of PALANGI dates earlier to the Parthian Period (2<sup>nd</sup> to 1<sup>st</sup> century BC) and during the Timurid Period to the 16<sup>th</sup> century.

<sup>38</sup> Also written as Bayqara. Husain Baiqara was Tamerlane's great-great-grandson

<sup>39</sup> The *iwan* is defined as “a great vaulted space open to the court and wholly or partially closed on three sides” (Knobloch 2002:50).

<sup>40</sup> Refer to Chapter 4 for a brief discussion of Wittfogel's (1957) definition of “hydroagriculture”.

forms of irrigation systems existed: 1) large canals diverted from perennial rivers, 2) karez, and 3) dams or weirs (Subtelny 2007: 122).

Architectural marvels of the Timurid Empire are found in Samarkand, Bukhara, Herat, and Mashhad to name a few cities (Ball 2008: 98). Architectural changes in Herat at this time included the reconstruction of Masjid-i Jum'a (or Friday Mosque) and the construction of a *musalla-madrassa*<sup>41</sup> and minarets<sup>42</sup> (Dupree 1973: 318). A minaret is a tower that marks a religious building, such as a mosque, and makes it visible on the landscape from a distance. It is used to call Muslims to prayer<sup>43</sup> (Knobloch 2002: 57, 171). Unfortunately, the British destroyed several architectural features of the Musalla complex in 1885. Amir Abdur Rahman Khan requested their destruction to clear "fields of fire" (i.e., areas to engage in combat) because they expected the Russians to invade Herat (Dupree 1973: 318).

## **2.4 Political History (1839 - Present)**

The effects of these recent wars have had a multitude of consequences for the residents in the southern part of the country. These consequences include landscape modifications, such as the destruction of agriculture, irrigation systems, villages, and cultural property. I present an overview of the recent wars in Afghanistan from the First Anglo-Afghan War to the current occupation by the United States and the North Atlantic Treaty Organization (NATO).

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<sup>41</sup> *Musalla* means "place of worship" and *madrassa* means "school or place of learning" (Dupree 1973:318).

<sup>42</sup> See below for a larger discussion of the current threats plaguing the architectural features of the Musalla complex.

<sup>43</sup> For more information on the origins and development of the minaret in Islam, refer to Bloom (1989, 1991). Bloom (1991) reviews K. A. C. Creswell's extensive work and presents the work of recent scholars.

#### **2.4.a First Anglo-Afghan War (1839 – 1842)**

The people of Afghanistan have experienced nearly continuous war and occupation since 1839. Three Anglo-Afghan wars have occurred. The longest of these was the First Anglo-Afghan war. The British invaded in 1839 the occupation continued until 1842. Dost Mohammad lost his throne during this war and was exiled to India until 1843, when he returned to Afghanistan. He continued to rule for another 20 years and is considered to be the last of the “great patrimonial kings” (Barfield 2010: 110,124, 137; Skaine 2002: 3). Dost Mohammad’s death in 1863 sparked a civil war in which two of his sons fought the heir apparent, Sher Ali, over their right to rule (Barfield 2010: 136; Kakar 2006: 10, 13-14). Sher Ali prevailed and ruled for 10 years after the civil war ended. He was considered to be Afghanistan’s first state builder (Barfield 2010: 137; Kakar 2006: 22). As Sher Ali’s rule ended, Russia expanded into Central Asia. In 1873, the British and Russians agreed that south of the Oxus River was Afghan territory (Barfield 2010: 139) and Afghanistan became an involuntary buffer between both empires (Barfield 2010: 139; Goodson 2001: 4).

#### **2.4.b Second Anglo-Afghan War (1878 – 1880) and Centralization**

The Second Anglo-Afghan War spanned from 1878 to 1880 and brought Abdur Rahman to the throne (Barfield 2010: 110-111). The British invaded Afghanistan in November 1878 following the arrival of an “uninvited Russian diplomatic delegation” and the Afghan’s refusal to the British for their own delegation (Barfield 2010: 140). Afghanistan served as an important piece of real estate. During this time, Afghanistan shared its northern border with the Soviet Union and its southern border with India. The

British wanted to protect their holdings in British India and Afghanistan represented a buffer zone between the British Empire and the Soviet Union.

Abdur Rahman's rule brought about changes in Afghanistan. Central to understanding modern issues today in southern Afghanistan is the fact that Rahman sought to centralize power throughout the country. To do this, he used military force and successfully created the appearance that Kabul was powerful (Barfield 2010: 111,155). In order to centralize power, it "necessitated breaking down the feudal and tribal system" to create "one grand community under one law and one rule" (Wilbur 1962: 19). Centralization included installing loyal followers as provincial governors, forcing migrations of Pashtun groups, and redrawing province boundaries. Rahman used the most modern military technology for the time to his political advantage. Yet he did not, however, adopt other technologies that would have facilitated economic development and as a result the economy remained subsistence-based (Barfield 2010: 161).

Forced migrations occurred during the Rahman's reign. In the late 1880s and early 1890s, Pashtun groups, especially the Ghilzai, from southern and south-central Afghanistan were relocated to north of the Hindu Kush.<sup>44</sup> He considered the Ghilzai to be his major enemies and although there was a rivalry between the Ghilzai and Durrani Pashtuns, when they were living in their tribal areas, they were perceived as being "pro-Pashtun" in a Pashtun dominated area (Dupree 1973: 419). However, relocation to the north, put the Pashtun in a non-Pashtun area and, as a result, lessened the ability of the Pashtun to revolt (Dupree 1973: 419). Additionally, with redrawing provincial

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<sup>44</sup> This is probably why the *qala*, a fortified structure and associated with the Pashtun, is found in the northern part of the country. Furthermore, case studies indicate that *qalas* near Kabul date during the late 1800s (Szabo and Barfield 1991:163). See [Chapter 8](#) for an in depth discussion.

boundaries, Rahman “split and divided” Pashtun tribes into different provinces. Furthermore, government officials in the south-central and southwestern Afghanistan, took it among themselves to sell and resell land thus ignoring joint ownership of village lands (Dupree 1973: 420)

In 1893, Rahman signed an agreement with Sir Henry Mortimer Durand, the British foreign secretary to India that separated Afghanistan from British India. This resulted in the Durand Line—the modern-day political boundary between Afghanistan and Pakistan (Goodson 2001: 35; Jones 2009: xi, 99; Tanner 2002: 5). The Durand Line is a 1,519-mile border that divides the Pashtun tribes of southern Afghanistan and Northern Pakistan. Jones (2009:99) notes the goal of the Durand line was to weaken the tribes so that it would “be easier for the British to pacify the area.” However, it continues to be a disputed boundary by the modern governments of Afghanistan (Jones 2009:99). In 1949, following Pakistan’s independence from the British in 1947, Afghanistan declared the Durand Line invalid (Jones 2009:100).

#### **2.4.c Ten Years of Peace and Women’s Reforms**

Following the Second Anglo-Afghan War, Afghans experienced only about 10 years of peace. From 1901 to 1919, King Habibullah Khan ruled as king inheriting the throne after his father’s death (Barfield 2010: 175; Skaine 2002: 3). The Third Anglo-Afghan War was the shortest, beginning and ending after a few short months in 1919. In 1926, under the rule of King Amanullah,<sup>45</sup> Afghanistan gained their independence from England and established an independent monarchy that spanned from 1919 until 1973 (Skaine 2002: 3).

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<sup>45</sup> Abdur Rahman’s grandson.

King Amanullah and his wife, Queen Soraya, introduced several reforms some of which focused on women's emancipation. Political reforms included: a constitutional monarchy and elected assembly (Barakat and Wardell 2002: 911) and the separation of religion from the state (Barakat and Wardell 2002: 911; Skaine 2002: 14). Reforms that focused on women or included them were the compulsory education for boys and girls, the emancipation of women, which freed them from concubinage and allowed them to choose their marriage partners, monogamy, and co-educational schools (Barakat and Wardell 2002:911; Skaine 2002: 14). However, not everyone supported King Amanullah's reforms. Uprisings occurred and resulted in overthrowing the king. In 1929, Habibullah lead a tribal rebellion and King Amanullah abdicated the thrown. Habibullah ruled for nine months before General Nadir Khan overthrew him (Skaine 2002: 14). Nadir ruled from 1929 to 1933. During his time in power, Islam became the state religion, women were required to wear veils, and he prohibited girls from attending school. However, from 1932 to 1934, girls were able to attend schools intended for girls only (Skaine 2002: 14-15). The assassination of Nadir Khan occurred in 1933, but his extended family continued to rule (Barfield 2010: 170). The new king, Zahir Shah, was young<sup>46</sup> so Nadir's brothers ruled in his name. Shah's cousin, Sardar Daoud, held the position of prime minister from 1953-1963. Shah dismissed Daoud in 1963 and began ruling at this time (Barfield 2010: 170).

In 1959 Shah and Daoud proposed reforms for women. Shah declared the "voluntary end of female seclusion and the removal of the veil" (*purdah*<sup>47</sup>) but it was the decision of individual families on whether they wanted to observe these changes

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<sup>46</sup> Tanner (2002:223) notes Zahir Shah was 19 years old when he acceded the throne.

<sup>47</sup> See Chapter Four for a discussion of Purdah.

(Barakat and Wardell 2002: 911; Dupree 1998a: 152-153; Skaine 2002: 15). The “unveiling” of women was a movement lead by Prime Minister Daoud under the pretense that the veiling and seclusion of women was not justified in Islamic law (Skaine 2002: 15-16). Barakat and Wardell (2002: 911) note that women in urban communities had greater freedom to enjoy these changes than those living in rural areas. Zahir Shah also established girl schools, allowed women to be employed in “gender appropriate” professions (e.g., as medical personnel and teachers), and in 1959 women were admitted to Kabul University<sup>48</sup> (Skaine 2002: 15).

Afghanistan reached out for aid and developed international relations from the 1930s to the 1950s. They accepted aid from Germany, Italy, and Japan in 1935 because Russo-Afghan barter agreements would not allow Russia to establish trade missions in their country (Dupree 1973: 478). They joined the League of Nations in 1934 (Dupree 1973: 477-478; Tanner 2002: 223) and signed the first treaty of friendship with the U.S. in 1936 (Dupree 1973: 477-478). In 1935, the Germans undertook a research mission in Nuristan. There has always been an interest in mining and mineral resources in Afghanistan. Afghan students traveled to Japan in 1936 to study mining and in Paktya in 1937, the Germans began exploring Afghanistan’s mineral resources (Dupree 1973: 478-479). In 1937, Afghanistan, Iran, and Turkey signed, but never implemented, a Treaty of Non-aggression and Friendship. Afghanistan remained neutral during World War II but profited economically from the war. Afghans supplied food to the Allied forces in India and New York became a purchaser for karakul<sup>49</sup> skins instead of London (Dupree 1973: 481-482). Chandrasekaran (2012: 17) notes the influx

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<sup>48</sup> Colleges for women had been in existence since 1946 (Skaine 2002:15).

<sup>49</sup> Karakul are “Persian fat-tailed sheep” (Chandrasekaran 2012:17). Also spelled *qarakul* (Dupree 1973:482).

of karakul skins to New York resulted from Jewish furriers fleeing Europe and Nazi persecution during the war. As a result, some Jewish business owners relocated to New York and needed new pelt suppliers. Estimates suggest that by 1942 the U.S. imported 2.5 million pelts a year (Chandrasekaran 2012: 17). This created a relationship between Afghanistan and the U.S. and ultimately led to the Helmand Valley Project (Dupree 1973: 481-482).

#### **2.4.d Helmand Valley Project**

During the 1950s, both the Soviet Union and the U.S. invested in Afghanistan. Soviet investments provided infrastructure, such as roads and airfields, as well as schools and irrigation systems in the north. The U.S. concentrated its investments in the southern part of the country with the Helmand Valley Project and an airport in Kandahar (Tanner 2002: 225-226). The exportation of pelts included a tax that went directly into Afghanistan's treasury. Zahir Shah used these funds to promote economic development in Helmand Province that he pursued for several reasons. First, Genghis Khan destroyed much of the city and irrigation canals during the 13<sup>th</sup> century and Shah saw an opportunity to rebuild. Second, his father seized control of the empire 17 years earlier and he wanted to legitimize his control by linking the family in the Royal Palace to the Ghaznavid dynasty (Chandrasekaran 2012: 17). Third, he envisioned redrawing the Durand Line to create a Pashtunistan,<sup>50</sup> or a unified nation of Pashtuns (Chandrasekaran 2012: 17-18). Daoud also supported Pashtunistan and his persistence of the issue caused Pakistan to close its border to the seasonal migrations of Pashtun nomads in 1961 (Tanner 2002: 227). In bringing the Pashtuns together on

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<sup>50</sup> For more on the concept of Pashtunistan, refer to Chandrasekaran 2012 page 18, Dupree 1973 pages 507 and 757, and Tanner 2002 page 6 and 225, just to name a few resources.

the Afghan side of the border, he thought that those living on Pakistan side, would “rise up and merge” (Chandrasekaran 2012: 17-18). Fourth, parts of Afghanistan are geographically isolated and the king sought to unite the country and “expand his influence” to all parts through development projects (Chandrasekaran 2012: 19).

#### **2.4.d Daoud’s Reign and the Constitution of**

In the position of Prime Minister from 1963 to 1973, Daoud sought to implement strong central control and additional reforms focused on women. He prohibited child marriage, declared that the dowry to be a woman’s property, established a family court with a female judge, and permitted women to join the police and military forces (Skaine 2002: 15). The Constitution of 1964 introduced more reforms for women. They gained the right to vote and the right to an education (Barakat and Wardell 2002: 911; Skaine 2002: 16).

A *coup d’etat* in 1973 promoted by Daoud ended Shah’s reign (Barfield 2010: 170; Grissmann 2006: 62). The internal conflict that resulted from the *coup d’etat* halted the plans to construct a new museum. The museum would replace the older 1922 building located in Darulaman—approximately 8 km from the city of Kabul. The original intent was that the building would serve as government offices and not as a museum (Grissmann 2006:61-62). Although Daoud planned the *coup d’etat*, military officials trained in the Soviet Union carried it out (Wahab and Youngerman 2007: 129).

#### **2.4.e Saur Revolution of 1978**

However, instability within the country was increasing and which concerned the Soviet Union. Daoud’s time in power was short. Reforms in the new constitution resulted in demonstrations by religious conservatives and women responded to these

demonstrations with their own. But these demonstrations by religious conservatives lead to anti-government protests and resulted in a *coup d'état* in April (Skaine 2002: 16), referred to as the Saur Revolution of 1978.

On April 27, 1978, Daoud was assassinated during the Saur Revolution—an army and air force planned *coup d'état* (Jones 2009: 12). Three days later, Nur Mohammad Taraki took control and established the Democratic Republic of Afghanistan as a Communist regime.<sup>51</sup> The Soviet Union provided military aid in the form of equipment and weapons to try to help stabilize the country (Jones 2009: 12-13). Estimates are that the Soviet Union gave more than \$1 billion in military aid up until 1979 (Tanner 2002: 229).

#### **2.6.f Soviet Invasion (1979 – 1989)**

The Soviet invasion began in 1979 and lasted until 1989. During this decade, nearly every province in Afghanistan felt the repercussions of the war (Goodson 2001: 5). During the ten years of Soviet occupation, rural areas experienced “widespread destruction of villages, fields, orchards, and irrigation systems,” (Goodson 2001: 5) and entire villages were leveled (Kaplan 1989; Wahab and Youngerman 2007: 184). Barakat and Wardell (2002: 912) note that these rural areas were targeted because of their resistance to the Kabul government. Estimates are that 30,000 villages were destroyed and historic cities and buildings demolished, with 1.3 million Afghans and 15,000 Soviet soldiers killed in the process (Burns 1990; Jones 2009: 25; Kaplan 1989). By 1980 nearly 3.3 million Afghans emigrated to Pakistan and Iran; meanwhile, ten years later, according to a 1990 estimate, there were 3.2 million registered Afghans and

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<sup>51</sup> Grissmann (2006:62) notes that the Democratic Republic of Afghanistan was established during Daoud's time in the government.

another 500,000 unregistered in Pakistan alone (IRIN 2012). Developmentally speaking, the Soviet invasion and subsequent emigrations from the country resulted in farm-labor losses, the number of infant mortality and serious illnesses increased resulting from the decline in services provided by health-care and sanitation facilities, and the loss of both skilled and educated workers (Jones 2009: 26).

#### **2.4.g Mujahideen Era**

Immediately following Soviet withdrawal, the country experienced another upheaval. Essentially, warlords ruled the country. In 1992, several Mujahideen groups overthrew the Soviet-installed Afghan President Muhammad Najibullah. Kabul went untouched during the Soviet occupation but in 1992, it was nothing more than rubble as whole neighborhoods were destroyed. Even mosques and government buildings were left in ruins (Jones 2009: 49-50). Southern Afghanistan had its own particular issues. Jones (2009: 50) notes that fighting between Mujahideen groups in Kandahar resulted in the destruction of “traditional power structures” and in rural areas competing groups (i.e., warlords, drug lords, etc.) gave rise to anarchy as the “tribal leadership system began to unravel.” In 1994, as a result of a civil war characterized by fighting between two Mujahideen groups—Hezb-e-Islami (Pashtun) and Jamiat-e-Islami (Tajik)—74,000 Afghans emigrated to Pakistan (IRIN 2012).

#### **2.6.h Taliban Rule**

The foundation of the Taliban and their ideological movement date back to the 18<sup>th</sup> century Deobandism<sup>52</sup> school of thought that stemmed from Dar ul-Ulum *madrassa* (i.e., religious schools) and originated in Deoband, India (Isby 2010: 33; Jones 2009: 48,

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<sup>52</sup> For more on Deobandism refer to Jones 2009:54-57.

54). In 1994, many of the Taliban members came from madrassas that were located in the Afghan refugee camps in Pakistan in the 1980s (Jones 2009: 57). In 1994, the Taliban began taking control of southern cities. The first two cities to fall were Spin Boldak and Kandahar and, by 1995, they had control over nine provinces. In 1996, the movement's leader Mullah Omar<sup>53</sup>—even though having had only a limited religious education—declared himself the Commander of the Faithful (*Amir al-Mu'minin*) by donning the cloak of the Prophet Muhammad<sup>54</sup> (Isby 2010: 13; Jones 2009: 52-53).

Early in the Taliban movement, it targeted warlords, holding them responsible “for much of the destruction, instability, and chaos” in the country since the beginning of the 1994 civil war (Jones 2009: 60). However, while the international drug industry—particularly the growing of poppy for opium in Afghanistan—helped to fund the Taliban movement, they claim to be ideologically opposed to drug use (Afsar, et al. 2008: 64; Jones 2009: 195; Rashid 2010: 118). Their production of opium has been rationalized by the fact that it is used by Western “*Kafirs* [unbelievers]” and “not by Muslims or Afghans” (Jones 2009: 195; Rashid 2010: 118), and therefore its production and distribution is considered part of a strategy to destabilize Western enemies of the Taliban.

The repressive, fundamentalist Islamic Taliban movement continues to oppress basic freedoms in Afghanistan. Aspects of life that the movement deems un-Islamic, including music, cinema, and most forms of entertainment, are prohibited (Goodson 2001: 128; Jones 2009: 61; Rashid 2010: 2). Furthermore, items of cultural property

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<sup>53</sup> Afsar and colleagues (2008:62) note that Mullah Omar, in addition to many of the major Taliban leaders belong to the Ghilzai tribal group (see Chapter Four for a discussion of the Pashtun and tribal groups).

<sup>54</sup> For more on the legend of the cloak of the Prophet Muhammad refer to Jones 2009:52-53.

(i.e., museum holdings and art collections) were declared idolatrous, polytheistic, and in violation of Islamic beliefs and therefore destroyed (Jones 2009: 61). As noted above, this included destruction of the Bamiyan Buddhas (Bearak 2001; Marlow 2011). The lives of women and girls changed drastically practically overnight. The Taliban not only prohibited girls from attending school but also prohibited most women from working or leaving their homes. Those who did leave the confines of their homes were required to wear a *burqa*—clothing that conceals them from head to toe (Goodson 2001: 118-119, 128; Jones 2009: 60; Rashid 2010: 2). In response to these measures and fall of cities throughout Afghanistan to the Taliban regime, refugees fled to Pakistan.<sup>55</sup>

### **2.6.i U.S. Invasion (2001 – Present)**

The first major invasion of U.S troops in Afghanistan began with a bombing campaign in October 2001, followed by invasion and ground attacks by U.S. and British forces. This occurred in response to information linking training camps of al-Qaeda organization to the attacks in the U.S. on September 11, 2001. By the end of the year, the Taliban rule was officially over (Jones 2009: 91-92). Resulting from the bombing campaign and subsequent warfare and occupation,<sup>56</sup> another wave of refugees fled to Pakistan. From 2002-2007, following the fall of the Taliban, more than 3 million Afghans returned to Afghanistan (IRIN 2012).

Today, military forces and NATO troops continue to occupy Afghanistan and provide assistance in the training of the government's military and the protection of

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<sup>55</sup> In 1996 after the cities of Jalalabad and Kabul fell to the Taliban, approximately 50,000 refugees arrived in Pakistan's North West Frontier Province (modern-day Khyber Pakhtoonkhwa); thousands more fled after the city of Mazar-i-Sharif fell. In 1999, another 30,000 refugees—mostly Hazaras—fled to Pakistan (IRIN 2012).

<sup>56</sup> It is estimated that from 1979 until 2001 nearly 5 million Afghans emigrated to Pakistan (IRIN 2012).

Afghan citizens. Since this is an on-going situation, a full analysis of the war still needs synthesizing. There have been significant repercussions with regard to people, villages, and the government structure.

Continuous war and occupation since 1839 has affected every aspect of Afghan life. The population and the natural environment have undergone significant changes. Major sections of the landscape have been modified in sometimes-hazardous ways and the country's infrastructure has undergone major alteration. Population shifts put a strain on the resources in those areas to which people have migrated. The livelihoods of residents—those that relocate and those that stay in their respective villages—are affected or changed due to the ways the natural environment and/or infrastructure are destroyed. For example, landmines condition the use of agricultural fields and farmers have adopted opium farming as a means of producing a crop with a higher cash value (Goodson 2001: 102). These factors also have had, and continue to have, affected the economic development of Afghanistan, making the country and its residents increasingly reliant on either outside humanitarian aid or profits from illegal activities that further perpetuate war and conflict. War, instability, and a change of livelihood have had an enduring effect on the people, the landscape, and the culture of Afghanistan. War and associated activities constitute significant current threats to the cultural property of Afghanistan and are discussed in detail below.

#### **2.4. Impact of Recent Wars on Cultural Property**

Some of the destruction to cultural property during conflict can be tracked through the use of satellite and publicly available imagery (e.g., Google Earth and other high-resolution imagery). However, since this is an on-going conflict, the extent to which

there have been impacts on cultural property by Soviet and U.S. occupations may not be fully comprehended until experts and researchers are able to work freely in the country and assess archaeological sites in a systematic manner. It is especially difficult to assess those sites located in rural areas and are not near large cities or district centers. Recent Soviet and U.S. Invasions have adversely affected cultural property, but the effects of the Second Anglo-Afghan war preceded these wars. These included not only the request that the British destroy a number of architectural features dating to the Timurid Period (Dupree 1973: 318) but also demolition of the site of **BALA HISSAR** (Barfield 2010: 142).

The period of Soviet occupation in Afghanistan was brutal. Whole villages were leveled—destroying lives, homes, and culturally significant architectural features (e.g., ancient cities and historical mosques) (Burns 1990; Kaplan 1989). Among the sites damaged, or destroyed, include **DARWAZA-I MASHAD** and **KANDAHAR**. In a 2,500-year-old section of Herat, **DARWAZA-I MASHAD**, the buildings were completely destroyed (Burns 1990). **KANDAHAR** was left “a rubble of collapsed stone walls and archways” and resembled other ruined Hellenistic sites in the Near East (Kaplan 1989). The Soviet invasion interrupted scientific research throughout the country, particularly the study of the stupa-monastery complex at **KANDAHAR** (Ball 2006: 41). Since on-the-ground research was difficult, Ball (2006: 43) proposed the Soviet invasion presented an opportune time to publish on fieldwork not yet written, to reassess and correlate past investigations, and to enter into a period of consolidation.

## 2.5 Current Threats to Cultural Property

There many threats plaguing Afghanistan's cultural property. Time and nature—most specifically, erosion, as evidenced at the Minaret at **JAM** and the palace facade at **MUNDIGAK** (Ball 2006: 41)—threatens the cultural property of Afghanistan. As Ball (2006: 42) points out, while erosion threatens sites, military occupation prevents specialists from conducting site inspections and from performing maintenance. Other threats include looting for economic gain, the intentional destruction of sites and sculptures for ideological reasons, war-related activities, and the destruction of sites in the interest of economic development. There are also benefits to economic development at archaeological sites, such as protection, conservation, and tourism.

### 2.5.a Looting

Looting is endemic at archaeological sites around the world, even in countries that are not experiencing warfare, but it often accompanies armed conflict (Dupree 1996, 1998b; Rich 2003; Stone 2008). In a country such as Afghanistan that has seen several decades of war, it is difficult to identify all of the causes of looting. Sites throughout Afghanistan have been plundered for their remains for centuries. However, this destruction has accelerated in recent decades. In 2004, as Director General of the National Institute of Archaeology and the Ministry of Information and Culture of Afghanistan, Abdul Wasey Feroozi (2004) gave a statement on the impact of war on the cultural property of Afghanistan at the 105<sup>th</sup> annual meeting of the Archaeological Institute of America. Sites, both documented and undocumented, are looted by multiple mechanisms—by hand and machine (van Krieken-Pieters 2006a: 231)—to varying extents. **AĪ KHANOUM**, in Takhar Province, and **MIR ZAKAH**, in Paktia Province, are among

the looted sites. Looting occurred at AĪ KHANOUM with the aid of bulldozers. At MIR ZAKAH, looting occurred from 1993-1995. Several other sites have been completely destroyed, including TILLYA TEPE, DILBERGIN TEPE, SURKH KOTAL, BAGRAM, ROBATAK, KHAMEZERGER, and KHARWAR (Feroozi 2004: 2).

### **2.5.b Intentional Destruction**

The Taliban have been a threat to the cultural property of Afghanistan. The best known Taliban-led destruction is the demolition of the 1,500-year-old Bamiyan Buddhas in March 2001 (Morgan 2012: 3; Rodriguez 2011). The destruction of the Buddhas occurred after UN sanctions increased against Afghanistan. As a result, it is thought that the act of destroying the Bamiyan Buddhas was the Taliban's way of "spitting in the face of a world that did not give a damn about their country" and that the Buddhas were more important than starving Afghan children (Morgan 2012: 3). Following a decree by Mullah Omar,<sup>57</sup> the Taliban have indiscriminately destroyed statues and other items depicting the human form that they deemed "un-Islamic" (Janowski 2011: 44; Manhart 2004: 403; Rodriguez 2011). Not only have the three Buddhas been destroyed, but more recently the cliffs near the empty niches in the Bamiyan Valley have suffered cracks and become unstable as a result of the bombing of the Buddhas (Manhart 2004: 404). The question of "What happens next?" to the fragmented remains of the

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<sup>57</sup> Oddly enough, Mullah Omar made an earlier decree in an effort to safeguard the cultural heritage of Afghanistan including the prohibition of illegal excavations and the illegal exportation of artifacts (Grissman 2006:68; Grissmann and Hiebert 2008:49; Van Krieken-Pieters 2006:232). Van Krieken-Pieters (2006:232) notes that, Mullah Omar stated "The Taliban Government states that Bamiyan shall not be destroyed but protected" noting that the site was significant because its construction predated Islam and, as such, "should be respected, according to the Koran."

destroyed Buddhas is a much-debated topic (Janowski 2011; Manhart 2004, 2006; van Krieken-Pieters 2006a).

Reconstruction of the Buddhas is favored by some organizations and individuals, while others stress improved infrastructure and security are more important (Janowski 2011; van Krieken-Pieters 2006a: 233). It is noted that Afghans see the rebuilding of the Buddhas as a step toward “restoring a sense of history and national pride” (van Krieken-Pieters 2006a:233). While reconstructing the Buddhas is an on-going debate, the primary goal, thus far, focused on stabilizing the cliffs that have become unstable as result of the explosions to destroy the large Buddha statues (Manhart 2004, 2006).

### **2.5.c War Related Activities**

As noted above, looting can be the result of war and occupation. However, this section addresses war-related activities, such as the construction of infrastructure by occupying forces. This section includes a discussion of the destruction of cultural property—karez systems—that been perceived during conflicts primarily as tunnels for strategic caching or concealment of weapons, personnel, and other materials. They have a history of being used by Mujahideen combatants during Soviet Occupation (Grau and Jalali 1998) and, more recently, by the Taliban for contraband, but it is unknown whether this use extends into the distant past. The Taliban has been known to use karez tunnels as hiding places for themselves and caches of weapons. One karez near Nimroz Province, contained “evidence of weapons, dwelling, and trash” (Cox 2009). As a result, in some cases, the U.S. military karez destroyed karezes in their effort to defeat the Taliban (Kelso 2001). Another threat to the karez is the construction of infrastructure for military occupation. Furthermore, strategic locations in historical

contexts that now contain archaeological sites remain strategic locations on the landscape today. As such, these locations are often turned into bases by occupying forces as in the case of Camp Leatherneck, U.S. Marine headquarters located in Helmand Province (Chandrasekaran 2012: 6; National Geographic Documentary 2010). War-related activities such as the expansion or construction of military installations can lead to the inadvertent distribution or alteration of karez systems.

#### **2.4.c.2 Occupation of Historic Places**

Military occupation of historic places has the potential to alter, damage, or destroy sites, as evidenced by events at Babylon in Iraq (Gerstenblith 2006: 295; McCarthy and Kennedy 2005; The Associated Press 2009). While there are laws that seek to protect these from destruction during times of conflict, the term “military necessity” legally justifies the occupation or destruction of a site or feature. However, what is legally permissible does not make the loss of cultural property easier to accept. That said, a strategic location on the landscape 300 years ago is more than likely still a strategic point today.

A National Geographic (2010) documentary on Camp Leatherneck focuses on the military base and outposts, the soldiers, and threats and goals of their mission in Helmand Province, Afghanistan. It notes there is an outpost base of the camp called “The Castle,” described as a 300-year-old castle that had been taken over from the Taliban. A few minutes of video are sufficient to show that the site has been altered due to digging and construction. Furthermore, the occupation of the site means that it is frequently under attack by the Taliban and subject to destruction from shelling and bombing. The occupation of historic sites during conflict should be avoided. It is the

obligation of nations to protect cultural property during conflict as put forth by the 1954 Hague Convention, Article 4(1) (Gerstenblith 2006: 262). However, this situation involving The Castle becomes difficult. Scholars (Gerstenblith 2006: 262-263; Merryman 1986: 838) note that Article 4(2) states that this obligation “may be waived only in cases where military necessity<sup>58</sup> imperatively requires such a waiver.” The site was previously in the hands of the Taliban and there is no doubt that if U.S. forces left The Castle because of its historic nature that the Taliban would reoccupy the site. As a result of both the Taliban and U.S. forces occupying The Castle, the structure and the site have been altered. Furthermore, the site risks destruction due to possible attacks and bombing by the Taliban to rid the area of U.S. forces. However, built monuments are not the only cultural property threatened by war. The art and artifacts housed in the Kabul Museum were also threatened.

### **2.5.c.3 The Kabul Museum**

The beginnings of the Kabul Museum date to the reign of King Habibullah (1901-1919) as a place to house his personal collection of artifacts. In 1919, a larger collection was assembled placed in Amir Abdur Rahman's Moon Palace outside of Kabul (Grissmann 2006: 61). During the reign of King Amanullah (1919-1929), the collection was moved to the Royal Palace in Kabul until 1931, when it was moved outside of Kabul to Darulaman (Grissmann 2006: 61). The structure that houses the museum had been built in 1922 as a government building (Massoudi 2008: 35). The museum remained in Darulaman until 1979, when the contents were abruptly removed

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<sup>58</sup> Article 14 of the Lieber Code notes “military necessity, as understood by modern civilized nations, consists of the necessity of those measure which are indispensable for securing the ends of war, and which are lawful according to the modern law and usages of war” (Merryman 1986:838)

so that the building could become the Ministry of Defense and the area established as a military zone (Grissmann 2006: 61; Grissmann and Hiebert 2008: 45).

In 1980, the museum collection returned to Darulaman, but in 1989, the collection was once again removed from the museum for storage and safekeeping. Destruction of the city of Kabul and the Kabul Museum occurred during the course of three years—from 1992 to 1995 (Grissmann and Hiebert 2008: 46). Looting occurred in 1993 when the area “changed hands.” Bombing in May 1993 destroyed the museum’s roof and top floor. Fire caused the destruction of office records and inventories (e.g., photographs, frescos from **DILBARJIN** and **DASHLI TEPE**, and Islamic glass and metals); while, the looting of collections occurred in storerooms, including vast coin collections—looting also occurred after 1995 (Grissmann and Hiebert 2008: 46-47).

In 1996, museum staff returned to the building in Darulama to inventory what remained of the collection. However, anticipating the arrival of the Taliban, museum objects were once again packed and moved to the Kabul Hotel, then locked by the Taliban Government (Grissmann and Hiebert 2008: 48). In 1998, work at the museum paused for two years due to bombing in Kabul by U.S. forces. Work resumed in 2000, but the actions of the Taliban government compromised the work. In March 2001, the ministry was vandalized and objects in the Kabul Museum and ministry were destroyed. Later that month the Taliban destroyed the Bamiyan Buddhas (Grissmann and Hiebert 2008: 48-49).

Some of the efforts to safeguard the movable cultural property of Afghanistan have been successful. These efforts include protection of the **TILLYA TEPE** collection; ivory, glass, and bronze objects from **BEGRAM**; and sculptures and frescoes from

**BAMIYAN** and **FONDUKISTAN** (Grissmann and Hiebert 2008: 53). However, van Krieken-Pieters (van Krieken-Pieters 2006a) cites Afghanistan as a case study illustrating the “types of threats” that need to be taken into consideration to protect cultural property during times of conflict as well as the necessity “to indicate what might constitute appropriate preventative action or countermeasures.” The Kabul Museum underwent restorations and renovations including the construction of new galleries to exhibit artifacts representing significant points in Afghanistan’s past. One exhibit, for example, holds archaeological materials from the excavations of the Buddhist monastery dating more than 1,400 years ago at **MES AYNAK** in Logar Province. **MES AYNAK** covers approximately 9,800 acres (3965 ha) and is well preserved with the exception of some looting in the past (Rodriguez 2011). Recently, the United States and Afghanistan Governments have jointly funded a project to build additional facilities for the Kabul Museum. These new areas will be used for storage of antiquities and gallery spaces (personal communication, R. Wright 2012). However, other items of cultural property are at risk. Immovable features, such as caves, present an interesting dilemma when they are archaeologically significant but modern populations are using them as housing.

#### **2.5.c.4 Forced Resettlement**

When we think of forced resettlement, refugee camps often come to mind and a multitude of Afghan residents have fled their homes located in war zones to settle in temporary camps in and around Kabul. However, for the Hazara—a Shiite Muslim people living in Bamiyan, Afghanistan—forced resettlement occurred in 1999, at the hands of the Taliban, when their homes and crops were burned. Some of the homeless fled to the caves in Bamiyan to weather the approaching winter. However, these caves

have historical significance and are part of Afghanistan's cultural property, and the government officials feared that refugee activity would be damaging. Therefore, in 2002, Bamiyan government officials evicted individuals and provided them with tents with the promise that the government would help build houses. Two years later, in 2003, the government had to evict another group of cave dwellers (Lawler 2004). While economic development will benefit not only local residents but the Afghan economy as a whole, there are consequences of economic development to the cultural property.

## **2.5.d Economic development**

### **2.5.d.1 Copper Mining**

Mining is another threat to cultural property. The site of **MES AYNAK** was first documented in the 1960s but was never excavated (Lawler 2010). In 2007, China Metallurgical Group Corp received a contract to mine copper at **MES AYNAK**. The project is the largest in current Afghan development, bringing in \$2.9 billion (Rodriguez 2011). Estimates indicate that there are 13 million tons of copper ore at **MES AYNAK** —possibly the second largest deposit in the world. Furthermore, the site is just a small fraction of the estimated \$1 trillion of minerals such as copper, iron, cobalt, and lithium, which have been identified in Afghanistan (Lawler 2010).

The Afghan Institute of Archaeology and DAFA are managing an excavation project that includes Afghan, French, and international teams of archaeologists as well as Afghan laborers. Unfortunately, there is not enough funding to hire the manpower necessary to conduct a full mitigation of the site. The goal of the archaeologists is to work as fast as possible to recover as much of the moveable artifacts, such as statues, pottery, and coins, before the site, and its buildings, are destroyed by Chinese

bulldozers (Rodriguez 2011). An article written in 2010 noted that over 100 statues had been uncovered and that the site includes seven *stupas*—structures that house religious relics. **MES AYNAK** may provide data on the “origin and demise” of Buddhism in the area as well as Buddhism's coexistence with Islam (Lawler 2010). However, other forms of economic development, such as the construction of new roads, pose threats to cultural property.

#### **2.5.d.2 Road Construction**

In Herat, minarets and associated architecture of the Musalla Complex dating to the Late Islamic Timurid Period (SPACH 2000: 11) have withstood the Anglo-Afghan Wars and Soviet invasion. As noted above, the destruction of a number of structures occurred in 1881. Several others were damaged during earthquakes in 1931 and 1951 (Dupree 1973: 318; Knobloch 2002: 133). In 2001, a wall was built around features of the Musalla Complex to prevent vehicular traffic through the archaeological site (Jawed 2001: 13-16; SPACH 2000). However, four years later, Lawler (2004) notes that large trucks and a widening road continued to threaten the Musalla Complex. The road, which reportedly was supposed to be closed, connected Herat and the Iranian border (Lawler 2004).

### **2.6 Principal Research Issues**

Afghanistan has been a country at war for the last thirty years. As a result, parts of the archaeological record have been destroyed and new research has been minimal. The Soviet invasion (1979-1989) halted on-the-ground research in Afghanistan. The halt in on-the-ground research continued until mid 2000 when French teams began renewed surveys in various parts of Afghanistan. There also has been significant

research focused primarily on heritage projects in the region of Herat and in Kabul by German teams employed by Development Alternatives, Incorporated (DAI). A team led by Rita Wright and Joseph Schuldenrein conducted a preliminary survey at the Buddhist site of **MES AYNAK**, as part of an ongoing project to document its archaeological remains and history. Additional research projects have focused primarily on the identification (Thomas, et al. 2008), protection, and conservation (Manhart 2004, 2006) of cultural property, as well as salvage projects, as in the case of **MES AYNAK**.

## **2.7 Chapter Summary**

In this chapter, I described an overview the geography and environment of Afghanistan with an emphasis on the Maywand study area in Kandahar Province. I presented the cultural geography focusing on the many ethnic groups and the role of women in agriculture. I discussed the physical environment, focusing on the physiographic regions and climate in order to present: 1) an overview of the agricultural crops grown, 2) important river systems, and 3) how groundwater is recharged. This chapter also presented summaries on specific archaeological periods relevant to my research and the study of karez systems. I discussed current issues relevant to conducting archaeology in southern Afghanistan, and reviewed the various impacts of historical events—including warfare—on its cultural property. This background information on the cultural geography, the physical environment, and the current issues of conducting research in Afghanistan provide the foundation for presenting the theoretical considerations of this project. Chapter Three will discuss these theoretical considerations focusing on landscape archaeology and landscape concepts.

### **III. CHAPTER THREE: THEORETICAL CONSIDERATIONS**

#### **3.1 Introduction**

“Landscape” (Crumley and Marquardt 1990: 73) is one of the terms central to this dissertation and defines the focus of theories of landscape archaeology (Chapman 2006: 11). It is helpful to review definitions of “landscape” as presented and discussed by several scholars (Bender 2002; Brück and Goodman 1999; Ingold 1993; Knapp and Ashmore 1999). Other relevant concepts include ethnoscape (Appadurai 1996), taskscape (Ingold 1993), heritage-scape (Di Giovine 2009), and archaeoscape (Parks 2010). I present these in the context of their relevance to archaeology and the karez in the study area.

#### **3.2 Landscape and Landscape Archaeology**

The term “landscape” as used in geography and anthropology (Brück and Goodman 1999; Crumley and Marquardt 1990; Ingold 1993; Knapp and Ashmore 1999; Tuan 1971, 1977; Wilkinson 2003) can be a descriptor for a specific geographic location as well as a collection of attributes by which a certain geographic location is defined. Landscapes contain settlements and sacred places, monuments, paths, and roadways. In archaeological contexts, settlements and sacred places are often discussed in direct association with the landscape, suggesting a close relationship between those features and the landscapes of which they are a part. Definitions vary. In its simplest form, “landscape” is defined as a context for the spatial relationships between humans and their physical environment (Crumley and Marquardt 1990: 73) while theories of landscape archaeology focus on the landscape as well as interrelationships among

multiple sites and the geographical spaces among them (Chapman 2006: 11). For the purpose of my study in southern Afghanistan, I will utilize the definitions for landscape and landscape archaeology offered by Crumley and Marquardt (1990) and Chapman (2006). However, I will also consider alternative definitions.

It is essential to consider both emic and etic perspectives. Landscape can not only be perceived by its inhabitants in various ways, but archaeologists also have different perceptions of landscape. Bender (2002) discusses the work of other scholars in her literature review. She makes two observations: 1) "landscape is time materializing" and 2) "landscapes and time are not objective" (2002: S103-S104). Time as Bender discusses it is not always linear. It can also be seasonal or cyclical, ceremonial, "event-driven or inflected," or even "elided, denied or exaggerated" (2002: S103-104). Furthermore, Bender (2002: S104) notes that "landscapes and time are not objective, not 'a given.'" That is, they are not neutral but rather are subjectively defined in that "the engagement [of people] with landscape and time is historically particular, imbricated in social relations and deeply political."

Knapp and Ashmore (1999: 5-8) define landscape as a stage or an "arena in which and through which memory, identity, social order and transformation are constructed, played out, re-invented, and changed." Using their perspective, the karez in Sayyadabad, Afghanistan, for example, can be construed as part of a landscape on which memory and identity are constructed, played out and reinvented. The karez is part of the cultural property because it has not only "withstood the test of time" but has served "various people throughout the country" (Kakar 2011: 13). Re-invention and change in the landscape is demonstrated throughout the history of the Middle East with

the abandonment and resettlement of villages and in the rehabilitation of in karez systems in Jordan as a result of changing political rule (Lightfoot 1996: 326; Lightfoot 2000: 218). English (1966: 35) notes that the number of karezes leading into Kirman City, Iran is unknown because the karezes have been built, abandoned and rebuilt for centuries to the extent that “their tunnels now honeycomb the plain and the margins of the city.” These patterns of abandonment, resettlement, and rehabilitation are also present in southern Afghanistan. However, my research is not without its limitations, which will be explained in detail below.

Definitions complementary to that provided by Knapp and Ashmore are discussed by Brück and Goodman (1999) and Ingold (1993) and illustrate the varying ways scholars perceive the landscape. Brück and Goodman (1999: 8) define the landscape as places having significance where “the natural world becomes both a source of metaphor for social relations and a physical manifestation of cosmological beliefs.” My research will be one of the first studies addressing landscape archaeology and the karez.

Ingold defines the landscape from a dwelling perspective, noting (1993: 1): “Landscape is constituted as an enduring record of—and testimony to—the lives and works of past generations who have dwelt within it ... and have left there something of themselves.” This definition refers to the visible archaeological and historical remains that are integrated or encroached upon by modern settlements and agriculture. Karez—both abandoned and active—have become part of the Afghan landscape and, as such, are part of an enduring record. In some instances, the karez is the only record indicating the location of a previous settlement. This is apparent in a visual survey in

the orthorectified imagery in which active and relict karez systems appear as features on the landscape (Figure 10).

Brück and Goodman (1999: 8) critique the concept of landscape in economic terms as a one sided relationship “in which nature is objectified, detached from history, controlled and manipulated as a means of maximizing economic returns.” However, the settling of a place, to some extent, does boil down to maximizing economic returns from the inhabitant’s viewpoint. Only through understanding the available natural resources can archaeologists understand why a particular location for settlement or other use was chosen. English (1966: 30) notes that qanat (i.e. karez) technology enabled permanent settlements in the region. However, it is through water laws based on Islamic law—the earliest is the *Kitābi Qanī*<sup>59</sup> (Book of Qanats), dating to the 9<sup>th</sup> century (Bosworth 2011: 45; English 1968: 179; Lambton 1969: 217) that water use disputes are minimized or settled. Scholars note that the practices of the karez are associated with customary law and pre-Islamic times. Prompted by disputes over karezes in the 9<sup>th</sup> century that the Tahirid governor, ‘Abdulla b. Tahir, ordered jurists from Khorasan and Iraq to write the laws of the karez (Lambton 1969; Subtelny 2007: 138-139). These ensured the maximizing of economic returns by stating that it was “illegal for anyone to dig a well or qanat near an existing qanat, if it can be assumed or proved that loss might result” (English 1966: 38; Lambton 1969: 199). However, the complexity of the technology, its construction, and use suggests an intimate understanding of and relationship with nature.

In the case of southern Afghanistan, understanding the scarcity of water helps understand the need for the karez. Creating maps illustrating conceptions of

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<sup>59</sup> Also *Kitābi Qunī* (Lambton 1953:217).

“landscape” as well as natural resources and land use is important for understanding villages and cultural landscape changes in an environment, especially in cases where a researcher is unable to work on the ground. These maps can subsequently be used to test conceptions and interpretations of cultural landscapes using more detailed data when direct access is available. It is always important to remember, of course, that a map is not a landscape but a conceptual representation of one that is subject to bias, error, and omissions.

One must understand the cultural significance of karez to the populations of villages in order to argue for interpreting the karez as part of the social fabric of southern Afghanistan. A clear understanding of not only this significance but the past history and current rate of decline in use of karez results in a need to place greater emphasis on rehabilitating these systems instead of installing mechanically pumped wells. Capital investment, diesel fuel, and maintenance of mechanical parts on a pump are expensive compared to traditional manual labor that is relatively low in technology and cost (Fipps 2006: 1; Kakar 2011). A karez and its collective use by a community structures social relations in a fundamentally different way than occurs with centralized control of pump wells (Kakar 2011; Lightfoot 2009) (Mohyuddin and Chaudhry 2012: 135; Mohyuddin, et al. 2012b: 143).

A different kind of landscape is evident with a mechanically pumped well. It changes the physical, social, and cultural characteristics. English (1966: 50) notes that residences are generally clustered along a karez. An increase in the number of individual pump wells and karez abandonment may alter where new household compounds are built and how they are built. There may be greater geographical space

between the households which may in turn, isolate women further from activities they would otherwise be able to enjoy if they lived in close proximity to one another.

Social relations are affected by pump wells because one person, generally a wealthy landowner, controls the pump and has control over who has access to the water, when, and at what cost. However, water is important in Islam and Muslims are not supposed to hoard water (this will be discussed further below) (Faruqui 2001: 2). A karez provides is maintained by the community; pumped wells change the communal dynamic and may promote the notion of “every man for himself.” Hazeltine and Bull (1999: 299) note that, in India and Zimbabwe, changing to more efficient wood-burning stoves affected social interactions among women in the community. Although women saved time by not having to gather as much firewood, they lost social time that gathering wood provided in exchange for slower cooking times. As a result, the stoves were not seen as an advantage and were rejected. Greater distances between settlements in southern Afghanistan that result from mechanically pumped wells could affect social relations among village residents. Since one individual often controls pump wells, their use may be accompanied by an increase in conflict.

An increase in conflict may appear in remote sensing imagery as a decline in residences, karez abandonment/disrepair, and an increase in individual wells in the community. Cultural changes resulting from karez abandonment and pumped well use include: 1) the loss of indigenous knowledge concerning karez construction and repair, 2) the migration of younger individuals to larger cities, and 3) shifts in livelihoods from trades passed down through the family to different forms of employment found in larger city centers (Lightfoot 2009: 28; Mohyuddin, et al. 2012b: 143-144), just to name a few.

The social effects of karez loss and abandonment are discussed further in Chapter Seven.

Brück and Goodman (1999: 8) critique the concept of landscape as a one-sided relationship “in which nature is objectified, detached from history, controlled and manipulated as a means of maximizing economic returns.” However, the settling of a place maximizes economic returns from the inhabitant’s viewpoint. By understanding available natural resources, archaeologists can deduce the selection of a particular location. Karez technology enabled permanent settlements (English 1966: 30) and in an effort to settle water related disputes, water laws based on Islamic law were written (English 1968: 179; Lambton 1969: 217; Subtelny 2007: 138-139).

Brück and Goodman’s definition refers to the way in which the archaeologists study landscape. International aid organizations have objectified the karez and focus on these systems in economic terms, thinking only about bringing water to the communities today and in the short term. However, karez can function for centuries while the average lifespan of a modern pump well is roughly 20 years (Kakar 2011: 6).

It is easy to see that there are economic advantages to utilizing mechanically pump wells in southern Afghanistan. The perspective depends on whether their intended use is to solve issues for the short term or long term. In the short term, there are many economic advantages to installing mechanized pumps. In a country where the average life expectancy is 45.02 years (CIA 2012b) and food security is an issue, pump wells provide ample water to irrigate agricultural fields and may help provide enough water for double cropping. Pump wells provide water that—when pumps are in working order—is always available and not regulated by water rights and time cycles

associated with shares. There is a minimal amount of water wasted with pumped wells since they can be turned on and off as needed whereas karez generally flows continuously. Qureshi (2002: 9) estimates that approximately 25% of the total annual volume of water is wasted in a karez. However, one of the ways karez are seasonally recharged is through groundwater resources (Lightfoot 2009: 19). “Wasted” karez water will eventually re-enter the water table at some point.

Unfortunately, the advantages of pump wells are short-term. Long-term disadvantages must also be considered. First, as noted earlier, not every resident has the advantage of owning their own well. The individual who owns the well controls who has access, when they have access, and what access will cost. While karez support the community as whole, pump wells support the individual. Outside organizations generally support the installation of pump wells. They require more expensive maintenance and parts and are run on diesel fuel. They may become abandoned artifacts on the landscape when Non-Governmental Organizations (NGOs) and international aid runs out. With a karez, the greatest expenditure is in construction and maintenance of the system is manpower that is often distributed throughout the community (Kakar 2011: 9; Mohyuddin, et al. 2012b: 136). Pump wells are dug deeper into the water table than the mother wells of karez systems. This lowers the water table, resulting in a diminished, or ceased, water flow in the karez. For example, pump wells in Syria have lowered the water table and diminished the flow of water in karez (Lightfoot 1996: 327; Wessels and Hoogeveen 2002: 568). While NGOs and international organizations are bringing water to the communities with pump wells, if these wells are situated on the landscape without adhering to local water laws, the wells

and resulting abandonment of karez, may be perceived by the affected communities as a blatant disregard for Islamic water laws.

### **3.3 Concepts for Landscape Approaches**

There are four useful concepts that describe landscape approaches: 1) ethnoscape (Appadurai 1996), 2) taskscape (Ingold 1993), 3) heritage-scape (Di Giovine 2009), and 4) archaeoscape (Parks 2010). These can be categorized in terms of analysis and definition. The concept of ethnoscape is a theoretical tool that researchers could use to analyze the landscape as a global construct and the agents responsible for implementing and/or influencing change. The concept of a taskscape is a theoretical perspective that researchers could use to analyze a particular landscape from the inhabitant's point of view. Heritage-scape and archaeoscape are theoretical constructs that researchers could use to define constructed features the landscape on the landscape. I will explore these four terms in detail focusing on their relationship to the archaeological features, the karez, and landscape perception.

Appadurai (1996: 33) defines ethnoscape as “the landscape of persons who constitute the shifting world in which we live: tourists, immigrants, refugees... and other moving groups and individuals constitute an essential feature of the world and appear to affect the politics of (and between) nations to a hitherto unprecedented degree.” There are various agents contributing to the ethnoscape(s) of southern Afghanistan. These agents include refugees who have relocated from their homes in warzones to camps situated in the northern part of the country. Other agents include the military forces, international aid organizations, and NGOs that are working throughout the country. These other agents plan and implement development projects that include but are not

limited to the installation of pump wells. These individuals are of a different ethnicity with various religious backgrounds and as such could contribute to a variety of consequences both good and bad for the local residents. As will be discussed in detail in Chapter Seven these agents often lack the language and cultural skills necessary to design and implement successful projects (Chandrasekaran 2012; Stewart and Knaus 2012: Isolation and Modern Expertise, para. 25). Therefore, these agents may bring more harm than good. Another agent is the Taliban, who are composed of multiple ethnicities, including the Pashtun. There is no doubt that their ultraconservative interpretation of Islam has influenced and altered perceptions of the landscape, such as artistic expression (e.g. cinema, music, entertainment) and cultural property (e.g. the Bamiyan Buddhas, museum collections in the Kabul Museum, etc.) (Bearak 2001; Goodson 2001: 128; Jones 2009: 61; Marlow 2011; Rashid 2010: 2).

Ingold (1993:158) notes “tasks are the constitutive acts of dwelling.” The taskscape refers to “the entire ensemble of tasks” and the relationships among tasks associated with dwelling activities. In the Maywand study area, these tasks would include cultivating and harvesting crops, cooking, washing, shopping, etc., to name a few. A taskscape can be used to analyze the landscape, tasks and their relationship to one another, as well as how the tasks represent human involvement on and within the landscape and the dwelling from the perspective of the inhabitant. In my project, the taskscape is the village and the tasks noted above include both agricultural and domestic activities that are performed based on gender roles. A taskscape can assist in understanding how karez condition relationships within the mud-brick walls of a village.

Di Giovine (2009: 6) uses the term heritage-scape for “UNESCO’s newly ordered social structure.” His theoretical model ascertains that “a real social structure which creates real material effects on a globally distributed population in accordance with UNESCO’s long term goals” (Di Giovine 2009: 6). A heritage-scape is a global construct, that is, constructed by international or multinational entities within a global context. Di Giovine (2009: 70) notes that “World Heritage sites are places, they are made places and they make up a new extensive and cohesive global place.” These places are part of a global map that has itself been termed a heritage-scape. A UNESCO World Heritage designation increases public awareness and international funding for scholarly research and preservation. It is something that has been formally defined with specific guidelines. A global map, this heritage-scape, strings together various sites that meet the criteria set by the 1972 UNESCO World Heritage Convention and thereby creates a conceptual “topographic representation of UNESCO’s reordered world, a method of mapping the World Heritage List” (Di Giovine 2009: 91). However, this map is created from a global perspective and may remove the monument or site from context and, to some extent, change its significance in the eyes of the visitor.

At present, only two sites on the World Heritage List are located in Afghanistan: 1) the Minaret of Jam and its associated remains, and 2) the Bamiyan Valley. I think there should be more than two places on the World Heritage List. One of these should be **MES AYNAK**. Another is the karez. It represents both tangible and intangible cultural property. While the concept of heritage-scape as Di Giovine (2009: 70) defines it may be useful and provides another layer by which we could conceptually perceive the landscape, it remains problematic. The term heritage-scape can be better applied by

focusing on the karez and illustrating that it is appropriate and sustainable technology, it is culturally significant, and its geographical distribution throughout the region.

Parks (2010: 437) defines an archaeoscape as “a landscape in which there are sites of historical and/or prehistoric cultural property and actors (...) that impact and, in turn are impacted by, prehistoric and historic remains.” Portions of the landscape in southern Afghanistan would qualify as an archaeoscape. It may be difficult to determine the boundaries of an archaeoscape without conducting on-the-ground research because remotely sensed data can only identify above-ground archaeological features. Temporary camps where the only remains are surface scatters of artifacts may not be identifiable in the imagery. An archaeoscape can be a helpful unit of classification for an archaeological complex and its associated features. An example of an archaeoscape in southern Afghanistan would be defined as the karez, the village and the agricultural fields it supplies, and other cultural features associated with the village, such as a cemeteries, mosques, and schools.

I will discuss three types of landscapes present within the study area: a landscape of conflict, the Pashtun landscape of social order and identity, and the changing landscape using four landscape concepts: ethnoscape, heritage-scape, taskscape, and archaeoscape. These themes are central to understanding the cultural landscape of southern Afghanistan. I will present two types of ethnoscapes: the Afghan ethnoscape and the Pashtun ethnoscape. I will present these themes in three groups: 1) a landscape of conflict that is defined as one that has been at war for an extended period and includes physical remains of war such as landmines, mass graves, etc.; (2) a landscape of social order and identity; and 3) the changing landscape, that is defined as

one that is undergoing change and that could include a shift from one type of land use to another.

### **3.4 Chapter Summary**

This chapter defines “landscape” (Crumley and Marquardt 1990: 73) and theories of landscape archaeology (Chapman 2006: 11) as they are central to this research. It also reviews definitions of “landscape” as used by other scholars (Bender 2002; Brück and Goodman 1999; Ingold 1993; Knapp and Ashmore 1999). It evaluates the concepts ethnoscape (Appadurai 1996), taskscape (Ingold 1993), heritage-scape (Di Giovine 2009), and archaeoscape (Parks 2010) for use in southern Afghanistan. These terms and concepts will be discussed and applied to understanding the landscape of southern Afghanistan with a particular focus on archeology and the karez in Chapter Nine.

## **IV. CHAPTER FOUR: THE KAREZ, SOCIAL CONTEXTS, AND SOCIAL ORGANIZATION**

### **4.1 Introduction**

This chapter seeks to place the karez within a historical, cultural, and technological context. It presents a detailed explanation of what a karez system is and how it functions, the distribution of karez in the world, how they are constructed, and their diffusion to Afghanistan from other sources of origin. I discuss the social contexts of Pashtun culture, Pashtunwali, and the social issues of karez ownership and management. Finally, I introduce the concepts of heterarchy and hierarchy (1979, 1987, 1995b) and discuss their relationship to the social organization of villages with karez systems. I present Wittfogel's (1957) hydraulic society theory as a hierarchical model and the work of Scarborough and colleagues (Scarborough 2003; Scarborough and Lucero 2010; Scarborough and Valdez Jr. 2003) as a heterarchical model.

### **4.2 Karez Distribution**

Water infiltration systems (i.e., qanats and karez) are a technology that appears to have originated in Iran between the 10<sup>th</sup> and 8<sup>th</sup> centuries BC (Kobori 1973: 215; Lightfoot 2000: 217-218). The earliest historically recorded mention of the technology appears on a tablet recording the words of the Assyrian king Sargon II in approximately 700 BC. His son and successor Sennacherib subsequently utilized the technology in the construction of his palace in Nineveh (Christensen 1993: 129; English 1968: 175; Honari 1989: 75; Lightfoot 2000: 218). As a result of Achaemenid rule (ca. 550-300 BC), the construction of karez spread throughout the Persian Empire. The

technology later spread to Egypt, Mesopotamia, Syria, and the Levant (English 1968: 170; Lightfoot 2000: 218). While extensive studies exist on karez systems in Iran, Oman, and China exist; karez systems in other regions have been largely ignored. Lightfoot (2000: 216) notes that a lack of these comparative studies complicates compiling a “complete regional picture of historic diffusion.” To augment existing data, Lightfoot (2000) conducted research in Jordan, Syria, and Yemen.

The construction in Syria, Iraq, and Jordan had occurred by at least the Roman era (ca. 64 BC – AD 330) as indicated by historical inscriptions as well as ceramic sherds and oil lamps found in and around karez systems. Their utilization continued through the Byzantine era (ca. AD 330 – 630) (Lightfoot 1996: 325; Lightfoot 2000: 218) and into the early Islamic period (ca. AD 661 – 750) and afterwards, while the construction of new systems occurred in Syria during this period (Lightfoot 2000: 218). During Abassid rule (ca. AD 750 – 1519), karez systems expanded or continued to be used in Iraq (Lightfoot 2000: 219). The abandonment of settlements occurs from changes in political rule throughout the history of this region caused karez systems to come in and out of use. Karez systems were often damaged when settlements were conquered and then repaired when they were reoccupied (Lightfoot 1996: 326; Lightfoot 2000: 218). The numbers of karez systems in use at any given time vary with historical and environmental circumstances. For example, the late 1800s saw the construction of new karez in central Syria and the repair and extension of others during the 1930s (Lightfoot 2000: 218). The 1920s saw the repair of six karez systems in the Jordan valley that were used until 1970. At one point, 90 karez systems were reported for the Near East. However, research by Lightfoot in Syria during 1993-98 (1996: 323; 2000: 219) demonstrated that

only 29 karezes were still in use, serving approximately 16 towns or villages. Estimates suggest that approximately 22,000<sup>60</sup> karezes are still functioning in Iran (Boualem and Rabah 2012 : 1; Boustani 2008: 213; Wulff 1968: 94).

### 4.3 Dating

Karezes are difficult to date directly because few artifacts or other datable materials have been found inside access shafts and tunnels. Local oral histories have helped date karez systems in Syria (Lightfoot 1996), on the Arabian Peninsula (Lightfoot 2000), in Iraq (Lightfoot 2009), and in Morocco (Lightfoot and Miller 1996). Kobori and colleagues (1980: 66) briefly mention that, according to their research, oral histories have provided “fairly equivalent stories” about karez construction but the authors do not provide in-depth appraisals of the accuracy of oral histories. Oral histories may not be historically accurate and information shared may vary based on the needs and perspectives of the individuals providing the historical accounts. However, while data from oral histories and historical texts may shed light on dates of karez construction, remotely-sensed data illustrates landscape features and modification (e.g., defensive fortifications, etc), providing not only another layer of data but verification of the data gathered through oral histories.

Lightfoot and Miller (1996) used a variety of methods (e.g., oral history, historical documents, remote sensing, and archaeological field survey) to understand and date the site of Sijilmasa (AD 757-1393) in the Tafilalt Oasis of southeastern Morocco. Remotely-sensed data provided them with an aerial perspective of the natural streams and rivers and man-made surface canals (Lightfoot and Miller 1996: 87), helping them

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<sup>60</sup> An article published in 2006, estimates that there were 32,164 active qanats in Iran (Salih 2006:83).

determine that the Ziz channel was most likely an artificial stream that had been diverted from its natural channel into a surface canal to support agriculture inside the oasis (Lightfoot and Miller 1996: 93). Using oral histories and historical texts, their research demonstrated that karezes did not appear in the Tafilalt Oasis until the late 1300s or early 1400s even though the technology was known and in use during the ninth century near Marrakech, Morocco (Lightfoot and Miller 1996: 98).

Other methods of dating water infiltration systems, such as dating of organic materials and associated artifacts using radiocarbon methods have proven helpful. For example, a karez in a village east of Aleppo, Syria, dates to the Byzantine period based on the cross-dated style of a ceramic oil lamp found in the tunnel (Wessels and Hoogeveen 2002:3). Radiocarbon dating has been used to help date water filtration systems on the Taribe Oasis in Syria (Kobori, et al. 1980). A large portion of the discussion by Kobori and colleagues focuses on the construction, water usage, and flow rates of the only functioning karez, Qanat Um-el-Garat, repaired in 1952 (Kobori, et al. 1980: 59). They briefly mention the possibility of radiocarbon dating if a suitable sample can be located. They specifically propose dating of a piece of wood, possibly a ceiling support, but do not provide additional information, nor a date, in their report (Kobori, et al. 1980: 66). While wooden posts used in the construction and maintenance of *pukios*<sup>61</sup> could be dated, wood can be problematic for obtaining accurate dates of initial construction since wooden posts are sometimes replaced.

Dorn and colleagues (1992: 145) note that *pukios* are “roughly similar to Old World qanats.” Barnes and Fleming (1991: 49) present a sectional view of a filtration

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<sup>61</sup> *Pukios* are water filtration systems located in southern Peru. Also spelled *puquios* (Barnes and Fleming 1991)

gallery and note its various names: *puquio* (in Peru), *apantli* (in Mexico), and *mina* (in Spain). A comparison of this diagram and that provided by Lightfoot (2009: 3) show that pukios, like the karez, consist of a mother well, vertical access shafts (also called *lumbreras, respiradores, pozos, ojos*), a tunnel (called *tajo, galleria, socavon*), and a reservoir or pool (called *cocha, arca, silo*). In fact, Barnes and Fleming (1991: 59, 60) point out that Schreiber and Lancho-Rojas (1988: 60) try to differentiate between pukios and Old World karez in an effort to make their argument that based on architecture the pukios differ from others found in both the Hispanic world and other parts of the world. Schreiber and Lancho-Rojas (1988) date construction of pukios during the Early Intermediate Period (ca. 200 BC to AD 800) (Moseley 1992: 185-186). Barnes and Fleming (1991) suggest some construction also occurred during the Colonial period. English (1966: 136) suggests that the Spanish brought the technology to South America, having learned from the Arabs.

Dorn and colleagues (1992: 136, 145) found rock varnish, “a dark coating that is ubiquitous on exposed rocks in drylands” and accumulates on rock surfaces, sealing in datable organic matter can be dated effectively using radiocarbon analysis, especially accelerator mass spectrometry (AMS) dating, which can be used to date samples as small as 5 to 10 mg (Renfrew and Bahn 2004: 142-143). They applied this to samples from stone lintels in the roofs of two pukios. Based on their findings, Dorn and colleagues agree with Schreiber and Lancho-Rojas that the construction of “at least some” pukios date during or prior to the Early Intermediate Period (1992: 145) while not ruling out the possibility that others may have been constructed during the Colonial period. Although the varnish formed *in situ* in an environment where flowing water was

present, Lightfoot (1996: 324) remains skeptical of the value of this method as well as that used to date the system on the Taibe Oasis. He notes (2000: 216-217) that the varnish may not accurately represent when the system was built because the stone may have been taken from an historical building and utilized inside the Peruvian pukio after the time of its initial construction. The wood used to date the karez in the oasis may also have been in a secondary context. One of the problems in dating karez is that, unlike other archaeological features, they do not change substantially in form or construction over time. The construction methods remain essentially the same in the early 1900s (Mohyuddin and Chaudhry 2012: 129; Mohyuddin, et al. 2012b: 134), yet it is unknown whether the same methods were used in antiquity.

#### **4.4 Karez Diffusion to Afghanistan**

In Afghanistan, karez are concentrated in the southern part of the country where they bring water to village households and agricultural fields. Karez are less common but present in parts of central and northern Afghanistan. However, as elsewhere, data are lacking on when these systems first appeared on the landscape. Researchers (Bowlby 1978: 24-25; Dupree 1973: 40; Knobloch 2002: 18) rarely provide historical data before they briefly introduce the technology and define the systems in the context of larger discussions of agriculture in Afghanistan.

There is a consensus among authoritative scholars (Kobori 1973: 215; Lightfoot 2000: 217-218) that karez represent a technology that originated in Iran between the 10<sup>th</sup> and 8<sup>th</sup> centuries BC. As noted above, their initial diffusion has been linked to Achaemenid rule (ca. 550-300 BC), when their construction spread throughout the Persian Empire and was introduced to Egypt, Mesopotamia, Syria, and the Levant

(English 1968: 170; Lightfoot 2000: 218). The Achaemenid Empire ruled in Afghanistan from ca. 530-330 BC (Ball 1982:374) with satrapies distributed throughout the country<sup>62</sup> and based on the above data, karez technology may have been first introduced to Afghanistan during this time. As discussed in greater detail below, the period of Achaemenid rule was generally one of peace and stability characterized by advances in political organization and economic development (Ball 2008: 58; Frye 1996: 92).

Karez technology also appears in Baluchistan, Pakistan. Rahman (1981: 12) proposes that the karez was adopted in Pakistan from Afghanistan rather than from Iran. He bases this reconstruction on the facts that: 1) karezes are concentrated along the Afghanistan-Pakistan border, 2) historically, karez diggers in Pakistan came from Afghanistan, and 3) words for karez in Pakistan differ from those used in Iran. While the first two facts support his interpretation, the last does not take into consideration the possibility that terminology may have been introduced via ancient routes that ran through Baluchistan, itself named for the Baluch who are thought to have migrated there from Iran as early as the Sassanian Period. These groups could have brought karez technology with them (Vogelsang 1992: 36-44). Rahman (1981: 11-12) notes that Kazmi (1951) suggests that Gabers or Zoroastrians brought the technology to Pakistan when they fled Iran ca. 7<sup>th</sup> century AD; whereas, Ahmad (1968) favors diffusion via Arabs from Afghanistan in the 7<sup>th</sup> century AD.

In western China, karez technology appears at the end of the 2<sup>nd</sup> century BC (English 1968: 170; Rahman 1981: 10). The origin of the karez in Xinjiang, China is a much debated topic with three different viewpoints: 1) it was indigenously developed or

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<sup>62</sup> For a larger discussion of Achaemenid satrapies and their distribution in Afghanistan see Mac Dowall and Taddei 1978:187-188.

imported from neighbors, 2) it was adapted from technologies in use in other parts of China, and 3) it was the result of the spread of technology from Iran eastward (Lein and Yuling 2006: 4). Huntington (1907: 262) favors the last viewpoint based on data from informants. He (1907: 270) notes that karez technology appears in Turfan ca. 1780.

It is probable that another wave of karez diffusion occurred during the 7<sup>th</sup> and 8<sup>th</sup> centuries AD with the expansion of the Arabs and Islam out of the Arabian Peninsula. The spread of the technology via this expansion is supported (Boualem and Rabah 2012: 4; Fagan 2012: Part V, Ch.15; Rahman 1981: 10). Fagan (2012: Part V, Ch.15, paragraph 23) notes that Islam inherited areas where irrigation had a long history. Interests in water management necessitated repairing old irrigation systems and the construction of new ones and the use of a "wide range of long-established methods." Rahman (1981: 10) notes that a second wave of diffusion occurred when the Arabs brought it with them from the Arabian Peninsula to North Africa, the Sahara, and southern Europe. Research conducted by Lightfoot and Miller (1996: 98) demonstrated the presence of karezes near Marrakech, Morocco during the Islamic Period (ca. late 1300s or early 1400s). The relatively late appearance of karez in Marrakech, Morocco; Xinjiang, China; and Baluchistan, Pakistan supports the theory of a second wave of diffusion. In Afghanistan, it appears as though the Achaemenids first introduced the technology and then the use of karezes expanded on a larger scale during the Islamic Period.

#### **4.5 Construction**

The karez is an environmentally-suitable, renewable source of water in arid environments (Lightfoot 2009: 6). Construction begins with the selection of a suitable

location upslope from the settlement and fields it will supply. A main or “mother well” (*sarchah*) is excavated into an aquifer (refer back to Figure 1) such as are found at the bases of hills and mountains, in alluvial fans, or in sediments where water has been diverted from dammed reservoirs, rivers, and wadi channels (Kobori 1973: 43; Lightfoot 2000: 215). A mother well can consist of one to ten in number (Mohyuddin and Chaudhry 2012: 129; Mohyuddin, et al. 2012b: 134). Excavation of additional vertical access shafts (*chah*) for air and debris removal follows, along with that of the horizontal tunnel through which the water flows. Karez construction is labor-intensive and dangerous. Excavation is done by hand, usually requiring a coordinated team of three to four people (English 1966: 136, 138; Lightfoot 2009: 6, 9; Mohyuddin and Chaudhry 2012: 131; Mohyuddin, et al. 2012b: 134-135). After construction, karezes require regular maintenance to ensure that the shafts and tunnel remain free from debris. Failure to maintain the system inhibits or lessens the flow of water (Wessels and Hoogeveen 2002: 2). Vertical access shafts provide light, ventilation, and access during construction and maintenance. These range in size from 70 to 90 cm wide, are 20 to 30 m apart, and are generally found in linear arrangements (Lightfoot 2009: 20; Mohyuddin and Chaudhry 2012: 129; Mohyuddin, et al. 2012b: 135). However, with a zig-zag alignment or branching, additional karez tunnels can help gather additional water and channel it into the main tunnel (Kobori 1973: 46; Lightfoot 2009: 20). The height of an underground tunnel ranges from approximately 60-300 cm while it has a typical width ranging from approximately 50-200 cm (Lightfoot 2009: 11).

Damage to karezes can result from numerous factors, including drought, development, and destruction, the latter being especially likely during wartime

occupations. Many karez have already been abandoned; others are at risk. Drought and the increased use of modern pumped wells lower the water table and result in decreased or ceased water flow. When this happens and water is no longer available to the settlement or agricultural fields dependent on it, a karez and its associated settlement are abandoned. Syria is a prime example of a place where modern electric and diesel-pumped wells have led to the abandonment of ancient karez (Lightfoot 1996: 327; Wessels and Hoogeveen 2002: 2). Mechanically pumped wells and their effects on karez are not new. In the mid-1950s, Cressey (1957: 123) noted that the use of mechanical pumps were replacing karez and that the newer technology contributed to the lowering the water table and the exhaustion of water reserves.

#### **4.6 Social Contexts: Tribal and Village Structure in Southern Afghanistan**

This section discusses the tribal and village structure in southern Afghanistan, focusing on the different Pashtun tribes and discussing tribal leadership with an emphasis on social organization, the code of Pashtunwali, and gender roles. It also discusses Pashtun culture and Pashtunwali as it relates to karez systems and aspects of karez management and the roles of specialists such as the *karezkan* and *mirab* in the construction and management of karez. Karez are community or privately owned but, as will be explained below citing case studies of villages, karez management is not determined solely by ownership. The distribution of water within a village and the allocation of water rights have a general structure but vary within each village.

#### **4.6.a Pashtun Tribes and Tribal Leadership**

The Pashtuns have a tribal form of social organization. Salzman (2008: Chp. 1, para. 10) notes that tribes operate differently than states. States represent a hierarchical form of social organization. They are “centralized, have political hierarchies, and have specialized institutions” (Salzman 2008: Chp. 1, para. 10). In contrast, tribes represent “balanced opposition, a decentralized system of defense and social control is characterized by self-help” (Salzman 2008: Chp. 1, para. 10). He (2008: Chp. 1, para. 8) explains balanced opposition by noting that everyone is part of a kin group with specific responsibilities or “collective responsibility.” These include the defense of each member but the kin group is also responsible for any harm a member causes to outsiders. Self-help is defined as “the actions taken by a group on its own behalf” (Salzman 2008: Chp. 1, para. 8). While Salzman is discussing how balanced opposition works in the Middle East and Arab culture, among the Pashtun tribes in Central Asia, the concept of Pashtunwali is analogous to collective responsibility. Understanding Pashtun tribal structure and Pashtunwali are important not only for understanding how social organization conditions water management but also the social and political implications, and complications, of intervening actors (e.g. military forces, NGOs, international aid organizations).

There are four lineages of the Pashtun that each claim descent from the four sons of the historic lineage founder, Qais (Chapter Two). These are the Durrani, the Ghilzais (also Khalji or Ghalji), the Gurghusht, and the Karlanri, (Barfield 2010: 25). Major “tribal components” associated with the Durrani include Zirak (Popalzai, Alikozai, Barakzai, and Achakzai), and the Panjpao (Nurzai, Alizai, and Isaqzai), while in

Peshwar major tribes include the Yusefzai, Shinwari, and Mohmand. Some of the major tribes among the Ghilzais include Hotaki, Tokhi, Kharoti, Nasiri, Taraki, Sulaiman Khel, and Ahmadzai. Some tribes among the Gurghusht include the Safi, the Kakar and Musa Khel. Among the Karlanri include the Wardak, Orakzai, Afridi, Wazir, Jaji, Tani, Khattak, Zadran, Mangal, Mahsud, and Khugiani (Barfield 2010: 25).

Some scholars discuss or introduce the Pashtun lineages briefly as groups (Goodson 2001: 14) or subgroups (Isby 2010: 26). Goodson (2001: 14) notes that the Pashtuns are divided into three major groups: The Durrani Tribe, the Ghilzai Tribe, and the “true Pukhtuns.” Isby (2010: 26) divides the Pashtuns into “at least four major tribal subgroupings: Durranis, Ghilzays, Ghurghustis, and the Kharoshtis and Eastern Pushtuns.” Cathell (2009: 5) states that there are 350 Pashtun tribes, while other scholars (Afsar, et al. 2008; Barfield 2010; Barth 1969; Lamer and Foster 2011) do not provide a number. Similar to Barfield (Barfield 2010: 25), Afsar and colleagues (2008: 62-63) affirm the Pashtuns are organized into five major groups (the Durranis, Ghilzais, Karlanris, Sarbanis, and the Ghurghushts) and subgroups and they provide greater detail of this organizational structure than Barfield (Figure 11).

#### **4.6.b Pashtunwali**

Pashtunwali<sup>63</sup> is a code of conduct<sup>64</sup> to which Pashtuns adhere that focuses on “maintaining honor and reputation” (Barfield 2010: 25, 59; Cathell 2009: 3; Goodson 2001: 15-16; Lamer and Foster 2011). In his discussion on Pathan<sup>65</sup> identity, Barth

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<sup>63</sup> Alternate spellings include *Pushtunwali* (Dupree 1973:126) and *Pukhtunwali* (Dupree 1973:126)

<sup>64</sup> Pashtunwali is also referred to as a “code of principles” (Barfield 2010), a social code (Cathell 2009), a code of behavior (Barfield 2010).

<sup>65</sup> Barfield notes (2010:25) that the British have often labeled the Karlanri Pashtuns “Pathans”.

(1969: 120) presents three Pashtunwali institutions that each focus on a specific area of activity: *melmastia* defined as “hospitality, and the honourable uses of material goods,” *jirga* defined as “councils, and the honourable pursuit of public affairs,” and *pardah* defined as “seclusion, and the honourable organization of domestic life.” Other scholars refer to these institutions as themes, principles, ideals, or concepts and provide greater detail (Dupree 1973: 126; Hawkins 2009: 17; Kakar n.d.: 3-6). Another way to describe these themes or principles of Pashtunwali is by identifying them as hospitality (*melmastia*), bravery (*ghayrat* or *nang*), honor (*namus*), gender differences (*pardah*), revenge (*badal*), and council (*shura*) (Goodson 2001: 15-16; Hawkins 2009: 17; Kakar n.d.: 3-6). Dupree (1973: 126) discusses the “ideals found in folktales” and notes that these ideals focus on “themes” that are associated with Pashtunwali and “other codes of the hills.” Other elements discussed by some scholars (Dupree 1973: 126; Goodson 2001: 15-16) but not others (Barfield 2010) include “*tureh* (sword), ‘*isteqamat* (persistence; constancy), *sabat* (steadfastness), *imandari* (righteousness).”

Among scholars (Barfield 2010; Cathell 2009; Dupree 1973; Kakar n.d.) definitions of the theme of hospitality vary. There are two terms used for hospitality: *melmastia* and *mehrmपालineh* (Dupree 1973: 126; Goodson 2001: 15). The term *melmastia* means “being a genial host” or “giving lavish parties.” Whereas, *mehrmपालineh* refers to “hospitality to guests” (Dupree 1973: 126). However, there is also a right to asylum (*nanawati*) (Dupree 1973: 126), which is also associated with hospitality. The literal translation of *nanawati* is “to enter into the security of a house” (Kakar n.d.: 4).

There appears to be some overlap among the concepts of bravery, honor, and

gender based on how these are presented by scholars (Dupree 1973: 126; Kakar n.d.: 4), and the definitions they provide. Dupree (1973: 126) translates *ghayrat* as “bravery” and notes that it means “defense of property and honor.” Kakar (n.d.: 3) notes that *ghayrat* and *nang* translates as “chivalry” and defines it as “honorable actions in battle” and “proper defense of honor.” Dupree (1973: 126) notes that *namus* means “defense of the honor of women.” However, Kakar (n.d.: 4) uses both “*purdah*” and “*namus*” when discussing gender boundaries. *Purdah* refers to the separation of the genders, whereas *namus* refers to protecting the honor of women. *Purdah* is used to control women, but men must also adhere to *purdah*. Kakar (n.d.: 4) states that “men are as bound by the rules of *namus*” and cannot enter women’s space, and vice versa.” Insult, or a violation of *ghayrat*, *namus*, or *purdah*, could result in revenge (*badal*). Hawkins (2009: 18) notes that the act of revenge is a decision made by the *shura*—council of elders, but Kakar (n.d.: 4) states that if the act of revenge is “not excessive,” then the council does not intervene.

The concept of *Pashtunwali* appears both to be complex and simple at the same time. I question to what extent the military forces—United States and foreign forces—understand *Pashtunwali* and have tried to minimize the effects of what may be perceived as insult and violation to themes such as *ghayrat*, *namus* or *purdah*. While expecting military forces to remain cognizant of these themes while working under extreme conditions may be idealistic, violation of themes would create larger barriers in “winning the hearts and minds” of the local population. It is clear that there are parts of household compound that are women’s space. It is probable that based on concepts of *Pashtunwali* that a forced search of a whole home by a male soldier would more than

likely be perceived as an insult. As Dupree (1973: 126) notes, ghayrat translates as “bravery” and that it means “defense of property and honor.” Therefore, the violation of entering the home and women’s space uninvited may result in an act of revenge by the homeowner, their family, or their village. Bringing dishonor to women is perceived as bringing dishonor to the family.

A karez is property—whether communal or private—and the destruction of a system or the closing of access shafts and the resulting death or diminished flow of water to the village may be perceived as a violation. This is evident in one documented expansion. Phillips (2009) states,

Rushing to expand a base to fit the new forces, American commanders seized farmland and built on top of these ancient underground-irrigation systems. The blunder is an indication of how fragile the effort to win public backing for the U.S.-led war can be. In some cases, the tension is over civilian casualties; in others, it's about the corruption of U.S. allies in the Afghan government. Here, it's an accidental clash of infrastructure technologies separated by a few yards of dirt and 3,000 years.

The base expansion occurred in Zabul Province and it is unclear whether the villages affected were Pashtun, but it clear that farmland was “seized” and construction occurred on top of a karez. Ultimately, the diminished water flow of the karez affected livelihoods

and the community needed to be compensated. Phillips does note that Capt. Paul Tanghe, advisor to the Afghan National Army battalion in Karezgay, understood the importance of the karez, yet it is clear that on the ground soldiers and military officials need to be better prepared in understanding the technology, culture, and history of a country either before, or during the early stages of, occupation. The same is true for aid organizations working in and with Afghanistan. Instead, as scholars (Chandrasekaran 2012; Stewart and Knaus 2012: Isolation and Modern Expertise, para. 25) note, external actors intervening in Afghanistan lack the knowledge—cultural, political, historical—and the skills to understand what programs are needed and how to make programs work in rural Afghanistan. It is important to understand tribal organization, Pashtun culture and Pashtunwali in order to develop projects accordingly. An understanding of these concepts could make projects more successful and at the same time, could prevent misunderstandings and the creation of more conflict. Understanding gender roles are also important to designing successful projects.

#### **4.6.c Roles of Men and Women**

Gender roles in Afghanistan vary greatly depending on ethnicity, social structure, economic status, and geographical location (Grace 2004; The World Bank 2005a: 53). These have changed substantially with historical events, especially for women. For example, women enjoyed more flexibility in gender roles and had more rights prior to Taliban rule in 1996. There has been some improvement in the rights of women since its decline in 2001. However, women's roles remain conservative in the south and women's rights are severely limited in comparison to those in the north. This is primarily a result of religious conservatism and Kandahar is a gender-conservative province

(Grace 2004: 22). This section will present the varying gender roles of men and women using case studies in Pakistan and Afghanistan, then discuss the relationship between Pashtun culture and gender roles.

There has been an influx of data focusing on women and how their roles and rights have changed (Skaine 2002), marriage (Berrenberg 2003; Tapper 1991), and their possible roles in reconstruction and poverty reduction of the country (The World Bank 2005b). However, there is less focus on information regarding daily activities and gender roles of both men and women. In the case of women, this may be a result of foreign men's inability to interview women in Pashtun culture. An understanding of the daily activities of men and women are understood by using data from various reports and case studies (Ahmed 1980; Grace 2004; Maletta 2008; Roe 2008; The World Bank 2005b) on water, agriculture, poverty, and livelihoods both within and outside of Afghanistan's political boundaries.

Ahmed (1980) conducted research on the Mohmands in Pakistan that focused on the "ideal-type model of [Pashtun] society" using field data and data on Pashtunwali. Research undertaken included Tribal Area Mohmands (TAM) and Settled Area Mohmands (SAM) with SAM representing an opportunity to test his hypothesis in an "encapsulated condition" (Ahmed 1980). Ahmed (1980: 4) notes, "Encapsulation ... involves larger state systems based on different organizational principles encapsulating smaller systems, which does not necessarily imply the naked use of force." During this research, he recorded the daily activities of both men and women for both TAM and SAM. For the case studies on daily activities, Ahmed (1980: 290) discusses those of

contractors and a businessman and their women in TAM and those of agriculturalists ranging in economic status and their women in SAM.

The daily activities of men differ in TAM than in SAM. Since the case studies focused on contractors and business in TAM, daily activities focused on economic activities such as trade and building contacts (Ahmed 1980: 290). Whereas, in SAM, daily activities focused on agriculture, such as cultivating and harvesting crops, and complying with the scheduled distribution of water (Ahmed 1980: 291). In both areas, men organize and procure the necessary items, including food, to ensure the domestic needs of the household are met (Ahmed 1980: 293).

Women's activities vary greatly from those of men, yet little difference, if any, is noted in the activities of women in TAM and those in SAM. Women wake earlier and go to sleep earlier than men. Ahmed (1980: 291) notes their rhythm of life "repeats itself with unending monotony." Women's activities focus on the household, including duties such as child rearing, preparing meals, cleaning and repairing the house, and washing clothes. Additionally, Ahmed (1980: 291,293) notes women feed any kept animals as well as helping to cut and carry crops and sifting wheat and maize grains.

In Afghanistan, data from case studies show that men participate in all agricultural related activities including the sale of produce (Grace 2004: 5, 6). For groups that are semi-sedentary, it is the men that watch the animals, shear wool, and cut the sheep skins while women prepare the skins with salts and make dairy products primarily for household consumption unless there is a surplus that could be sold (Grace 2004: 9). Those participating in non-farm related activities do so both in and out of the village. As will be discussed in detail below, women's activities generally keep them

confined to their homes. However, a shift among men's livelihoods from farm to non-farm sources of income, in addition to the hardships experienced during war time, may encourage a change in gender roles giving women more responsibility for matters in and out of the household (Barakat and Wardell 2002: 910; Grace 2004: 8). In households where women weave carpets, it is the men that trade them (Grace 2004: 12)

Grace (2004) discusses women's roles in agriculture based on her research in five villages in Afghanistan. She notes that, in general, women in wealthy households appear to control money (Grace 2004: 8) but, because it is culturally unacceptable for them to shop at the bazaar, it is men who actually spend money.<sup>66</sup> Working on the land is associated with the stigma of being poor. Women are, with some exceptions, not permitted to work on the land and therefore seek other forms of earning a livelihood. Grace (2004: 11) notes in Daulatabad Village Three, in Faryab Province, northern Afghanistan, women increased carpet weaving production since Taliban rule because of: 1) drought, 2) the fact that they were not permitted to work on the land, and 3) both land and livestock were confiscated by the Taliban. While women are permitted to work in opium poppy cultivation in some parts of Afghanistan, such as Badakhshan<sup>67</sup> in the north, in the south women are restricted to home-based roles such as preparing meals for agricultural laborers, a task that becomes especially labor-intensive during harvests (Grace 2004: 59). However, there are reasons to think women in Helmand may play a

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<sup>66</sup> The notion of it being culturally unacceptable for women to shop has not changed in the last century; in fact, Pennell (1909:190) notes that the men even purchased the cloth for the women's clothing.

<sup>67</sup> Badakhshan is more gender equitable than other areas in Afghanistan (The World Bank 2005:55).

greater role than those in Kandahar.<sup>68</sup> Data from several provinces including Helmand indicated that women and girls participate in a number of farm-based activities and post harvest crop activities that are for domestic use and for the market. These activities include preparing the seed bed, weeding, horticulture, and fruit cultivation as well as cleaning and drying fruits and vegetables (The World Bank 2005a: 55).

While there seems to be some flexibility in gender roles, these vary greatly depending on the province and community. A report on the roles of women in national reconstruction and poverty reduction in Afghanistan issued by the World Bank states that women take care of household activities, such as water collection, but it is unclear if this activity is the same for all women throughout Afghanistan or limited to particular provinces (The World Bank 2005a: xiv). This is the case for Mohmand women in Pakistan (Ahmed 1980: 291). Dupree (1973: 249) notes “the village builds a ‘mud curtain’ around itself for protection against the outside world.” However, Maletta (2008: 175) takes this metaphor one step further and notes that rural women “live behind a double mud curtain” referring not only to the village walls but also to the homestead walls from which they “are seldom permitted to venture out.” This suggests that women are limited to activities such as collecting water and animal husbandry in the confines of their own villages.

#### **4.6.d Pashtun Culture and Gender Roles**

As will be discussed in further detail in the recommendations section in Chapter Seven, international aid workers and agencies lack the cultural and language skills

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<sup>68</sup> It is unclear whether women’s roles in agriculture differ greatly in Helmand as compared to Kandahar. Kandahar was not one of the provinces studied by either Grace (2004) or The World Bank (2005) and data may simply be lacking for this province.

necessary to design and implement projects within the country (Chandrasekaran 2012; Stewart and Knaus 2012: Isolation and Modern Expertise, para. 25). Not knowing of, or understanding, the role of Pashtunwali and its importance in the Pashtun culture could attribute to a community's unwillingness to accept a project or program. *Understanding and Addressing Context in Afghanistan: How Villages Differ and Why* (Pain and Kantor 2010) presents data on 11 villages distributed among four provinces and discusses the importance of understanding the context of villages when designing, implementing, and evaluating programs. Pain and Kantor (2010: ix) define context as "the existing social order, as determined by how a society is organized and the ways in which prevailing economic, political and social systems contribute to that organization." The report notes that NGOs and government field staff acknowledge that villages vary and point out the use of terms such as "progressive" or "traditional" and that an underlying tone in these terms "is an intention on the part of the international actors to bring villages into the modern world and out of their tradition-burdened past" (Pain and Kantor 2010: 14). Furthermore, they (Pain and Kantor 2010: 14) state,

Louis Dupree's assertion that "the village builds a 'mud curtain' around itself for protection against the outside world" reflects an attitude that sees the village as a symbol of rural backwardness and tradition.

However, with their stress on the importance of context and understanding village social order, there is no discussion of Pashtunwali. The term does not appear in

the document, even though two villages are discussed in Dand District in Kandahar, a province that is primarily composed of Pashtun groups. Furthermore, Pashtunwali is exempt from their conclusion on comparing villages. They have an excellent opportunity to introduce Pashtunwali and the importance of adhering to purdah among the Pashtun when they (Pain and Kantor 2010: 30) note “specific social norms related to ethnic identity (for example, the education of girls in Pashtun villages) may also influence practice.”

It is unclear whether reform will have an effect on purdah and its role in Pashtunwali. More data are needed from these villages where strict religious conservatism is prevalent. Until reform can be exercised in these rural areas, NGOs and governmental agencies must work within these constraints and find ingenious ways to expand the livelihoods of women and provide them greater access to goods and the market. One such opportunity is creating opportunities for women who can move between the strict gender roles. Grace (2004: 6) notes that while the sale of products, especially agricultural produces, is a male task, widows that do not have male children are able to go to the bazaar to sell or purchase goods. These elderly women who have access to the bazaar could assist village women that are socially bound to adhere to purdah in bringing their goods, such as craft items or goods produced in the home, to the bazaar to be sold. While the producing of goods for the market and the sale of them through a middle person might require the permission of women’s husbands, it provides access to the market while working within the social constraints of purdah.

#### **4.6.f Management of Karez Systems**

There are many reports that focus on water, irrigation, and agriculture in

Afghanistan (Hussain, et al. 2008; Kakar 2011; Qureshi 2002; Rout 2008). Case studies tend to focus on Herat, Ghazni, or Helmand Provinces, but little is known about the karez in Kandahar. Rout (2008:34) notes that karez concentration is within the Helmand River basin. However, he provides little data on the organization, operation and performance of the karezes, and notes that data are lacking (Rout 2008:36). Since data are lacking from southern Afghanistan, it is necessary to make inferences that utilize data from Pashtun villages with karezes in eastern Afghanistan.

A wealth of information on the construction, management, and organization of the karez can be pieced together by examining karezes in multiple case study areas (Roe 2008; Rout 2008). Kakar (2011), who conducted research in the Sayyadabad District of Wardak Province, eastern Afghanistan, provides data on the social aspects of the karez. His research focused on five Pashtun villages utilizing karezes. He found that karez ownership can be either communal or private (Kakar 2011; Roe 2008; Rout 2008). In the case of Sayyadabad District, karez are privately owned (Kakar 2011:4). Rout (2008:37) notes that karez are a community-based system, suggesting ownership by the community. However, Rout does not address ownership in his discussion of the Bawran karez—which provides for two villages—located in the Pashtun district of Zarghun in Herat Province (Rout 2008:38). Roe (2008:42) states that surface water is a “common property resource and subject to community management” but water can also be private property, if it was obtained from a privately constructed karez. In general, researchers note that karezes tend to be community property—this is true for the Bawran Karez. However, case studies by Kakar (2011) and Roe (2008) suggest they are private property. At primary research sites located in Nangarhar, Ghazni, Kunduz,

and Herat provinces, the karezes are privately owned and managed within the extended family, instead of being managed by the local shura or a mirab (Lee 2006: 2).

#### 4.6.f.1 Specialist Roles: The Karezkhan and the Mirab

There are two main specialist roles in communities with karez: a *karezkan* and a *mirab*. A *karezkan* constructs and maintains karez (Rout 2008:ix). Kakar (2011:10) notes that prolonged war in Afghanistan has affected the amount of karezkan and that villages often share a karezkan as a result. Water management for karezes and canals in Afghanistan use a mirab system.<sup>69</sup> The earliest descriptions of the mirab's duties are found in the Samanid administrative manual *Mafātih al-'ulum*, although the position dates to ancient times (Boswort 1969: 151; Lambton 1969: 123-124; Subtelny 2007: 140). This system varies in structure throughout the region (Kakar 2011:8). The mirab,<sup>70</sup> or watermaster (Dupree 1973: 501), supervises the distribution of water, settles water disputes, and enforces water rights.<sup>71</sup> The mirab is a landowner within the area he serves and is appointed by other landowners in the village (Kakar 2011: 8; Lee 2006: 3; Qureshi 2002: 13; Rout 2008: ix) or by the village council (Knobloch 2002: 23). The role of mirab is a "semi-voluntary" position that results in "enhanced community status" (Roe 2008:42). Karezes are private property in Sayyadabad District and, as a result, the communities did not need a mirab whose services they could not afford (Kakar 2011: 8). Similarly, where water is limited and only a small portion of land is irrigated, the community *shura*,<sup>72</sup> or a private individual, manages the water resources instead of a

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<sup>69</sup> The *mirab* system is also used in communities that have canal irrigation systems.

<sup>70</sup> In Zandra Village, Baluchistan, this individual is called "malik of karez" or "mirabb" (Mohyuddin, et al. 2012b:139)

<sup>71</sup> In 1973, Dupree (1973:501) noted that the role of mirab was not understood by many literate Afghans, in particular, government officials.

<sup>72</sup> *Shura* is a local counsel or assembly of elders (Roe 2008:vii).

mirab (Lee 2006: 2; Roe 2008: 42). In the case of Bawran Karez in Herat Province, the village council appointed the mirab that manages the system (Rout 2008:38). In Kandahar, the village council manages the system and controls water allocation shares (Snee 2007).

In cases where there is not a mirab, an *arbab*<sup>73</sup> manages the irrigation system. An *arbab* is a senior individual from the shura (Lee 2006: 2). The *arbab* may manage the irrigation system in one village or several. If the *arbab* is responsible for managing several villages, this individual comes from the community with the greatest irrigated land and largest water allocation (Lee 2006: 2).

#### **4.6.f.2 Water Rights and Distribution**

Water rights vary depending on whether a karez is a common resource owned by a community or whether it is owned privately. Water, which is considered to be communally owed, is distributed to shareholders based on a *shab-roz*<sup>74</sup> (night and day) cycle and determined based on the quantity of land owned (Kakar 2011: 9; Lee 2006: 4). In Sayyadabad District, this is not the case. Instead, water allocation depends on the amount of input invested in the system during its construction. Access is directly related to the initial investment. However, the older the karez, the smaller water allocations become due to inheritance and dividing allotments between sons (Kakar 2011:9).

Karez health depends on frequent maintenance. *Hashar*<sup>75</sup> is the labor or in-kind contributions by farmers for irrigation maintenance and is determined based on the area

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<sup>73</sup> Referred to as “white beard” in Pashto, Turkman, and Tajik (Lee 2006:2).

<sup>74</sup> Lee (2006:4) notes the day-night cycle is *shab o roz* and notes that the allocations function on multiples or fractions of 24 hours. Furthermore, terms for the day-night cycle vary. For example, “*mardi kar* (a man’s [daily] work)” is used in Zala Qala in Kunduz province (Lee 2006:4).

<sup>75</sup> *Hashar* is called “*wragom*” in the village of Zandra, in the District of Ziarat, Baluchistan Province, Pakistan (Mohyuddin, et al. 2012b:131).

under cultivation<sup>76</sup> by each farmer (Roe 2008:42). That is, hashar depends on the amount of shab-roz a farmer receives. Overseeing hashar is the responsibility of the mirab (Roe 2008:42). Zandarkarez in Baluchistan requires yearly maintenance that takes 3 to 4 days to complete (Mohyuddin, et al. 2012b: 136).

Water allocation rights can be inherited and tend to be passed down a line of patrilineal descent, that is, from father to son. Women in traditional Pashtun society are generally not involved in agricultural activities and tend to remain hidden behind “a mud curtain” (i.e., mud-brick walls that surround their homes) (Dupree 1973:249; Maletta 2008:175). In a communally held karez, water shares are distributed based on the amount of land owned by specific individuals, while for a privately owned karez water rights are distributed based on the amount of initial investment (Kakar 2011: 9). A case study conducted in Faryab Province<sup>77</sup> notes that in the Tagab Valley water is owned by everyone, but landowners that control its use (Wily 2004: 49). In Kandahar Province, the village council controls water management by allocating water in half-hour shares<sup>78</sup> (Snee 2007). Case studies in the discipline of anthropology that discuss how water allocation disputes in rural villages with karezes are handled/resolved are lacking. Data comes from water and agricultural reports and scholars (Lee 2007; Lee 2006; Qureshi 2002; Qureshi and Akhtar 2004; Rout 2008) do not go into much detail on the finer aspects of culture, such as the relationship between Pashtunwali and the karez system. However, a number of instances could be inferred. Mirabs settle water allocation

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<sup>76</sup> In Zandra Village, Pakistan, maintenance labor depends on water shares. Therefore, if a share is six hours of water, the shareholder contributes one day of work. The shareholder could perform the work himself, pay someone to work in his place, or pay money (called *nagha*, locally). Mirabs use this money to hire maintenance labor (Mohyuddin, et al. 2012b:136).

<sup>77</sup> Faryab Province is in northern Afghanistan and borders with Turkmenistan.

<sup>78</sup> No additional data is provided.

disputes based on water laws. It is expected that the mirab would settle disputes in an equitable way and that he would adhere to the code of Pashtunwali to further ensure that he is fair in his decision making. Water management laws developed in the Middle East separately from the concept of Pashtunwali, and due to the lack of studies on the subject, a clear relationship between the mirab and Pashtunwali is not known. To fully understand the role of tribal structure and Pashtunwali in the management of karez systems specific studies should be undertaken targeting specific questions. These questions should focus on: 1) what is the role, if any, of Pashtunwali in the management of karez systems and 2) what is the role of kinship and/or tribal social structure and their relationship to karez ownership and management.

What is more concerning is that while mirabs settle disputes over water management, the shura settles all other disputes. However, a recent news article notes that rural villagers are seeking the assistance of the Taliban in their areas to resolve disputes instead of turning to the council that has been the traditional way (Jawad 2013). Jawad (2013) notes that is a result of the absence of governmental offices in the rural areas that are designed to handle disputes.

#### **4.7 The Importance of Water in Islam**

Water is important to all living things. In Islam, “water is of profound importance” (Faruqui 2001: 1). The perception of water is that it is a social good—“a gift from God”—and that it belongs to the whole community, no one person owns water (Faruqui 2001: 22). This is because water is used to wash before prayer (ablution, *wudu*) and bathing (*ghusl*) (Faruqui 2001: 1). Scholars note that there is a priority to water use rights as well as two laws governing uses (Faruqui 2001: 2, 23; Mallat 1995: 129). The

first use of water rights is for drinking, to sustain human life. Humans are to have an “acceptable quantity and quality” of water and it is a right of everyone to have access to water. *Haq al shafa* or *shirb* refers to “the law of thirst or the right of humans to drink or quench their thirst.” The second use of water rights is for domestic animals, also *haq al shafa*, refers to “the right of cattle and household animals;” while the third use is for irrigation purposes (Faruqui 2001: 2, 23). *Water Management in Islam* (Faruqui 2001) discusses these water use rights and the importance of water in Islam in addition to including information on water management policies relevant to actors at multiple levels in the Middle East. This book presents the findings of the workshop *Water Resources Management in the Islamic World* held in 1998 in Amman, Jordan. Among the water management principles is that “water resources must be managed and used in a sustainable way” and that “sustainable and equitable water management” relies on “universal values” (e.g. fairness, equity, concern) (Faruqui 2001: 23).

A recurrent theme in my research is that karez technology is appropriate and sustainable for semi-arid environments found in the Middle East and Central Asia. Based on the use rights of water noted above and the sustainability of the karez, it is easy to see that a change from karez technology to pump wells can result in a change of water management practices that are not in line with the key principles of Islam. These include the shift from water resources that are sustainable (karez technology) to one that is not sustainable (pump well) and that prohibit, or limit access to water resources. Exorbitant prices for access to water is not equitable. Islamic religious principles emphasize equitability to water resources. Pashtunwali also emphasizes equitability.

Changes in the social landscape affects equitable water management principles. First, the version of Islam that the Taliban practice and promoted, especially in the southern part of the country, is an ultra conservative translation of Islam and neither fairness nor equality are a key principle. This is especially evident in their treatment of women. Second, feudal conditions that are present in southern Afghanistan change the social organization from one that is heterarchical in nature, because of tribalism, to one that is hierarchical (Pain 2010; Pain and Kantor 2010). The change from a karez to a pumped well in a village that is controlled by one individual or one family in a hierarchical structure could limit the access of water to others in the village thus creating more power for that individual/family in control. Furthermore, when intervening actors do not examine the role of water or understand its importance in Islam and the relationship between the karez and the village, they are changing the social landscape in ways that are probably not conducive to their mission goals. Ultimately, this change in technology limits access to water necessary to sustain life and livelihoods, affect the ability to cleanse oneself before prayer, and creates power that leads changes in social organization that result in inequality that actually goes against the teachings of Islam.

#### **4.7 Social Organization**

In this section, I introduce concepts of heterarchy and hierarchy (1979, 1987, 1995b) and why it is important to understand power relations and their relationship to the social organization of villages with karez systems in southern Afghanistan. I present Wittfogel's (1957) hydraulic society theory as a hierarchical model and point out that feudal Europe seems to be the exception to the theory and I discuss why this important to the Maywand study area. Using the work of Scarborough and colleagues

(Scarborough 2003; Scarborough and Lucero 2010; Scarborough and Valdez Jr. 2003), I present a heterarchical model as an alternative model to hierarchy.

#### **4.7.a Concepts of Heterarchy and Hierarchy**

Crumley (1979, 1987, 1995b) was the first scholar to present considerations of heterarchies versus hierarchies as applied to social complexity. Her work stemmed from neurological research conducted by William McCulloch (1945). She urged researchers to consider a heterarchical form of social organization rather than the notion of “hierarchy-as-order” that had been the “almost unconscious assumption” of social scientists working on social complexity (Crumley 1995b). She defines hierarchies as “... elements which on the basis of certain factors are subordinate to others and may be ranked” (Crumley 1979: 144; 1987: 158). Heterarchies, on the other hand, are defined as “the relation of elements to one another when they are unranked or when they possess the potential for being ranked in a number of different ways” (Crumley 1995b: 3). She goes on to explain that:

“... the hierarchy-heterarchy relation admits both temporal and spatial flexibility; for example governmental heterarchies ... can move over time to hierarchies and vice versa without invoking the rhetoric of collapse. Heterarchical relationships among elements at one spatial scale or in one dimension (members of the same club) may be hierarchical at another (the privilege of seniority in decision making). Heterarchy is both a structure and a condition” (Crumley 1995b: 4).

At the time of publication, Crumley (1995b: 4) noted that only three areas involving heterarchy had been explored: scale, power, and values. My discussion will

focus on heterarchies of power and as Crumley (1995b: 4) notes, power relations are complicated and that “it is important to know how power shifts occur and under what conditions various power distributions constitute stable and unstable configurations.” As noted, throughout history, Afghanistan has experienced multiple invasions, occupations, and shifts of power. Determining whether there are social heterarchies, hierarchies, or a combination of the two present in the villages with karezes in southern Afghanistan will help understand the karez and power relations. I will explore whether there is a shift of power in the village when a karez dies. Understanding these power relations may offer insight into how NGOs, international aid organizations, and the local government could be more efficient when planning and implementing projects and programs. Answering these questions may also provide insightful data on how power can be shifted out of the hands of the Taliban and warlords in the rural areas that are out of the reach of Kabul. After a shift in power occurs, focus could be directed to rebuilding and rehabilitating karezes and possibly developing methods to train local individuals in how to construct and maintain karez systems. Rehabilitation and training will empower local communities by not making them dependent on outside power structures. I will discuss two different models that focus on water and power and explore their relevance to karezes in southern Afghanistan. These models include Karl Wittfogel’s (1957) hydraulic society theory that promotes a hierarchical model and the work of Vernon Scarborough (2003) which promotes a heterarchical model.

#### **4.7.b The Hierarchical Model**

Wittfogel’s (1957) Oriental Despotism presents a hierarchical model that discusses hydraulic agricultural (also called hydraulic society theory) and the “total

power” necessary to construct major waterworks in Oriental societies. Wittfogel’s (1957: 18, 28) model of hydraulic society theory requires a massive labor force, the bulk of which are peasants, to construct waterworks. He states “farmers eager to conquer arid lowlands and plains are forced to invoke the organizational devices ... which offer the one chance of success: they must work in cooperation with their fellows and subordinate to a directing authority” (Wittfogel 1957: 18). However, there is a difference between hydroagriculture and hydraulic agriculture. Hydroagricultural farming is “based on small-scale irrigation” and while the food supply is increased, there is no change in organization or social control that accompanies hydraulic agriculture (Wittfogel 1957: 18). In the hydraulic agricultural society, as there is a development of major water works, subsequent social and economic developments occur. These include the calendar making and time keeping, the construction of roads, aqueducts, navigational canals, defensive structures, in addition to monumental works such as palaces and temples, just to name a few (Wittfogel 1957: 29-41).

Wittfogel’s hydraulic society theory is considered to be dated and is “generally abandoned by the social sciences” (Scarborough 2003: 19). Price (1994: 193), on the other hand, critiques anthropologists studying irrigation that do not discuss Wittfogel’s work or “dismiss it instantly as ‘reductionistic,’ ‘simplistic,’ or ‘mechanical’”. Although Julian Steward (1955a, b) tested the hydraulic hypothesis and brought it to the attention of scholars, it was the work of Robert McC. Adams (1965, 1966) that not only tested Wittfogel’s theory and challenged it but he also laid the foundation for it to be challenged by other scholars. Price (1994: 198) notes that scholars have rejected hydraulic models because of despotism was not present. Wittfogel emphasized that hydraulic

civilizations would prosper and grow and that there would be subsequent changes in social organization. According to Wittfogel (1957: 12), the right circumstances occur “above the level of an extractive subsistence economy, beyond the influence of strong centers of rainfall agriculture, and below the level of a property-based industrial civilization.” As Trigger (2003: 279) notes, primary civilizations (e.g. Egypt, Mesopotamia, Maya) were prevalent in varying environmental conditions and had access to varying resources. The fact that these primary civilizations were able to settle and grow in these varying conditions challenges Wittfogel’s hydraulic society theory.

Price (1994) re-examines the writing of Wittfogel and “remodels” hydraulic theory. As I have noted above, Wittfogel (1957: 18) provides a distinction between hydroagriculture and hydraulic agriculture. Price (1994: 188, 189) states “critics ignore [Wittfogel’s] distinction between hydraulic and hydroagricultural societies” and that this distinction is important to correctly evaluate Wittfogel’s theory.

Scarborough (2003: 19) notes that instead of “debunking” the hydraulic theory, scholars are focusing on understanding the “economic underpinnings of water use.” Additionally, water management is “more complex and textured” and that these systems and the communities that utilize them differ both hierarchically and heterarchically and that varying degrees of centralization are present (2003: 19). This is important for understanding the karez and shifts of power in southern Afghanistan.

An important point can be stressed regarding Wittfogel’s hydraulic society theory and karez irrigation in southern Afghanistan. He (1957: 44) notes there is a difference between what he calls the “hydraulic rulers” and the “secular and priestly lords of the ancient and medieval West.” The difference is that the hydraulic rulers acted on a

grander scale and their monumental works intertwined with more areas of life. These rulers also had a larger resource base, both in labor and in materials. In contrast, in feudal Europe, the labor resources available to manorial Lords were restricted to those serfs that were “attached” to the manors (Wittfogel 1957: 44). Furthermore, revenues from “centers of ecclesiastical authority” were used to construct the monumental architecture of Medieval Europe (Wittfogel 1957: 45). Therefore, in feudal Europe there does not appear to be the coming together of people and the subsequent submission for the greater good that Wittfogel notes is necessary for the shift to hydraulic agriculture. Feudal Europe grew and progressed based on a different economic and political system than those ‘civilizations’ he associated with the hydraulic society theory. However, there are aspects of both hierarchy and heterarchy present in southern Afghanistan

#### **4.7.c The Heterarchical Model**

A heterarchy model is proposed by scholars (Scarborough 2003; Scarborough and Valdez Jr. 2003) that “sees the groups within a densely settled hinterland as interacting largely among themselves, using the city as their exchange and communication node. The result is a highly flexible, yet specialized, set of exchanges through time and space. Communities in the countryside are resource-specialized and organized economically to produce a few things well. A set of interdependencies evolves across a region, connecting communities in a web of exchanges.” Interdependencies exist in Afghanistan with the seasonal migrations and trading between nomadic or semi-nomadic groups and sedentary groups residing in villages (Dupree 1973).

Scarborough (2003: 13) proposes two paths that are temporal by which water management can be understood in relation to “the early development of agriculturally based, complex societies.” These paths are: the accretional approach and the expansionist approach. Both approaches represent different ends of a continuum. The accretional approach is “a slow, stable development of the agrarian resource” and fewer risks are taken when modifying the landscape, whereas, the expansionist approach “radically and rapidly exploits resources.” With the accretional approach, organization tends to be heterarchical. It could be associated with Wittfogel’s definition of hydroagriculture. The expansionist approach suggests a hierarchical organization that could be associated with Wittfogel’s definition of hydraulic agriculture. It is clear that one approach tends to be heterarchical while the other hierarchical and as Crumley (Crumley 1995b) and scholars (Rogers 1995; Zagarell 1995) have noted both heterarchy and hierarchy could exist during different times and also at the same time.

## **V. CHAPTER FIVE: REMOTE SENSING AND LIBRARY METHODS**

### **5.1 Introduction**

This chapter presents a recent history of archaeological applications of remote sensing and presents a discussion of how anthropological theory has shaped remote sensing applications for anthropology and archaeology. I discuss in detail the remote sensing and library methodologies used in this study, discuss the limitations of conducting archaeological research in a highly charged political environment, and present selected case studies of archaeological projects utilizing remote sensing technologies in arid environments that have influenced the methods used in this study.

### **5.2 Remote sensing defined**

In its broadest sense, remote sensing can be defined as “the gathering of information at a distance” (Campbell 2007: 4). This broad definition encompasses all forms of remote sensing, including kites, balloons, airborne methods and satellites, plus other systems not involved in sensing the Earth’s surface. However, numerous narrower definitions of “remote sensing” exist. All emphasize that remote sensing undertakes observation of the Earth’s surface from a distance using electromagnetic energy. Campbell (2007: 6) provides a definition as applied to the use of satellite and airborne remote sensing:

Remote sensing is the practice of deriving information about the Earth’s land and water surfaces using images acquired from an overhead perspective, by employing electromagnetic radiation in one or more regions of the electromagnetic spectrum, reflected or emitted from the Earth’s surface.

When Pruitt first coined the term “remote sensing” in the 1960s, it set multispectral remote sensing apart from the use of visible spectrum aerial photography. Current definitions include both airborne cameras and satellites.

### **5.3 A brief history of remote sensing in archaeology**

Remote sensing technologies have existed for nearly 200 years. Summaries of their history in archaeological research are provided by other scholars (Parcak 2009; Sever 1990), so my discussion will focus on the period from 2000 until the present. It will overlap to some extent with summaries by Campbell (2007) and Parcak (2009) while continuing where they leave off.

Early uses of aerial photography occurred during a period that has been identified as one corresponding to the application of a theoretical paradigm in archaeology known as functional-processualism. It was aimed at understanding “social and cultural systems from the inside by determining how different parts of these systems are interrelated and how these parts intersect with one another” (Trigger 1989: 314). Scholars focused on the “site”, defined as “the smallest unit of space dealt with by the archaeologist” (Willey and Phillips 1958: 18), and addressed specific research questions. One of remote sensing pioneer O. G. S. Crawford’s contributions to archaeology was his encouragement of the use of aerial photography that he used to detect features not readily visible on the ground. Ditches, banks, and crop marks, when analyzed in conjunction with other architectural and site remains, can provide an understanding of how different components of ancient social and cultural systems are related. Aerial photography allows these kinds of features and their positions on the

landscape to be detected, documented, and used for the visualization of sites.

Photogrammetry, “the practice of making accurate measurements from photographs”

(Campbell 2007: 8), was another advancement in the science of aerial photography.

Aerial photography in conjunction with photogrammetric techniques became routinely used in government programs and assisted with providing data for topographic and geological maps and for soil and forest surveys (Campbell 2007: 8).

World War II and the Cold War led to further advancements in remote sensing technologies. During World War II, the technology moved from a focus on the visual part of the electromagnetic spectrum to the infrared and microwave portions (Campbell 2007: 9). Color infrared film, also known as “camouflage detection film,” was developed during World War II. However, Robert Colwell was the first to systematically use the technology and apply it to plant sciences (Campbell 2007: 12).

Remote sensing in archaeological research increased in use from the 1940s through 1960s as a direct result of archaeologists learning photo interpretation skills while working in intelligence during World War II. However, it was during the 1960s that aerial photography became a methodology for testing anthropological and archaeological theories. The 1960s marked a paradigm shift in anthropological thought from culture history to processual archaeology, the latter of which placed a stronger and more scientifically oriented hypothesis-testing emphasis on identifying and interpreting processes of cultural change (Renfrew and Bahn 2004: 17). The “New Archaeology,” a trend that started in the late 1950s, included focuses on themes such as cultural ecology and settlement pattern studies. Remote sensing was especially useful where traditional ground surveys or where climate (e.g. desert environments) was challenging.

Archaeologists embraced remote sensing technologies to assist in conducting wide scale surveys even in the Maya area, although thick vegetation covers often hindered these surveys. Among the emphases of processual archaeology was the development of projects that were regional in scope (Binford 1964). Remote sensing allowed the viewing of entire valleys, permitting the analysis of ecological relationships and settlement patterns. Large-scale surveys were facilitated by technological advances in remote sensing that resulted in improved maps and images used in planning and executing on-the-ground surveys (see Gumerman and Neely 1972).

The late 1960s and early 1970s led to further advances in remote sensing technologies with the launch of Landsat, the first Earth observation satellite, originally named the Earth Resources Technology Satellite (ERTS). The Landsat program, which began its development in 1967 with the goal of obtaining “information about the Earth’s natural resources,” recorded imagery in both the visible and near-infrared spectrums (NASA 2011). After the first satellite was launched in 1972, 300 researchers from a variety of disciplines—a third of whom were affiliated with international institutions—were invited to test the utility of the imagery (Mack and Williamson 1995: 169; NASA 2011). Skylab, launched in 1973, contained a camera system—the Earth Resources Experiment Package (EREP)—that enabled astronauts to acquire more than 35,000 images of the Earth’s surface (Lillesand, et al. 2004: 403). While some landscape and archaeological studies using satellite remote sensing were carried out when it was in its infancy, researchers did not make extensive use of satellite technology for archaeological investigations until after the 1970s.

A shift in archaeological theory that critiqued processual archaeology (also known as processualism) was underway in the 1970s. By the mid-1980s, this new trend had been termed “postprocessual archaeology” or postprocessualism by Ian Hodder (Hodder 1985; Trigger 1989: 444). In contrast to processualism, postprocessualism set out to positively “broaden the range of archaeological theory” and to “emphasize the symbolic and cognitive aspects of human endeavor” (Renfrew and Bahn 2004: 45). One facet of postprocessualism is landscape archaeology, in which more recent uses of remote sensing are seen. Landscape archaeology focuses on issues such as interrelationships among sites and the geographical spaces between them and especially perceptions and uses of the landscape of which they are a part (Chapman 2006: 11). Remote sensing enables visualization of large areas by which archaeologists can employ tools such as a geographic information system (GIS) to evaluate images of the landscape along with attributes such as archaeological sites and environmental data—soils, rivers, and geology. Understanding these relationships can refine the understanding of processes such as change in social complexity as well as how societies are affected both symbolically and cognitively. A multitude of research projects focusing on landscape archaeology have utilized remote sensing technologies (Clark, et al. 1998; Garrison, et al. 2008; Saturno, et al. 2007; Sheets and Sever 2007).

As remote sensing continued to be used by archaeologists during the 1990s, it became evident that different models and techniques would be necessary for successful prediction of site locations. Predictive modeling was an objective of processual archaeology. Furthermore, early remote sensing researchers stressed the need to consider a variety of types of imagery when performing research (Parcak 2009: 29).

Tom Sever's work in Costa Rica and New Mexico illustrated that Landsat MSS imagery did not have adequate resolution (80 m) for most archaeological applications. Instead, he discovered that the Landsat TM (30 m) and the airborne Thermal Infrared Multispectral Scanner (TIMS) were better options for this kind of work. Sever (1990: 109) noted at the time of writing his dissertation that TIMS was a new instrument with six channels that was designed for geological research. His research utilized 5 m resolution TIMS imagery and found it was successful in identifying previously undiscovered roads (Sever 1990: 20, 175).

The quality of imagery improved dramatically from the 1980s through the 1990s. Landsat imagery, both MSS and TM, was too coarse to visually detect many features of interest to archaeologists (e.g. prehistoric roads, canals, structures, etc.). Higher-resolution satellite technology facilitated the identification of smaller archaeological features. Although it had been available 10 years earlier, SPOT imagery began to be used largely in archaeological site detection during the 1990s. The SPOT 4 launch in 1998 provided 5 m resolution. The quality of imagery improved even further with the IKONOS satellite in 1999 that provided 1 m resolution (Parcak 2009: 31). For example, it became possible to detect features such as mounds, roads, canals, and structures.

The use of remote sensing for archaeological research has continued into the new millennium as evidenced by greater numbers of archaeological publications, conferences, grant applications, training programs, and dissertation research projects (Parcak 2009: 31). Conservation and heritage protection are additional applications in which remote sensing has recently been utilized in the field of archaeology. Advances

in technology during this time have included more high-resolution satellites, such as IKONOS, Quickbird, and GeoEye.

In the last decade, Light Detection and Ranging (LiDAR) data has contributed to our understanding of many relevant archaeological areas, including landscapes occupied by ancient Mayas. While laser technology has been available since the 1950s, its application in LiDAR came much later. Early LiDAR focused on “scientific inquiry and industrial applications” and was used for atmospheric profiling in which the instrument was pointed toward the atmosphere to gather data on suspended particles (Campbell 2007: 240). By the late 1980s, however, “several technologies matured and converged” thus providing the foundation for development of modern precision scanning LiDAR systems (Campbell 2007: 240-241).

An early archaeological application of LiDAR was on Sheets’ *Proyecto Prehistoric Arenal* in 1984, in which the instrumentation was flown by NASA specifically for the project (Sever 1990: 304). The first use of LiDAR for archaeological applications in Costa Rica was successful in that it provided too much data. However, researchers determined that the technology was ineffective for the project’s purpose because it recorded too much data that could not be interpreted without extensive and difficult ground-truthing (Sever 1990: 305). Since its first use in Central America in the late 1980s, LiDAR has proven valuable for archeological research. The last 30 years contributed to the refinement of LiDAR technology and its processing. Additionally, specific research questions could be the difference between a successful project and one that creates too much data. In the last decade, LiDAR aided projects in Mesoamerica (Chase, et al. 2011), North America (Gallagher and Josephs 2008;

Harmon, et al. 2006), and Europe (Bewley, et al. 2005; Crutchley 2006; Deveraux, et al. 2005).

#### **5.4 Fundamentals of remote sensing and instruments**

There are a number of fundamental concepts required for understanding remote sensing. These include understanding the measurement of wavelengths, issues in imagery resolution, and the differences between passive and active systems.<sup>79</sup> It is also important to understand different categories of instruments, focusing on those that are multispectral, high resolution, medium resolution, and coarse resolution, as well as the role of Google Earth.

In remote sensing, electromagnetic waves are generally categorized by their wavelengths along the electromagnetic spectrum, which are usually measured in micrometers ( $\mu\text{m}$ ) or nanometers (nm). For example, Landsat's Multispectral Scanner (MSS) band 1 has a wavelength range of 0.5-0.6  $\mu\text{m}$  (500-600 nm) (Lillesand, et al. 2004: 4).

The term *resolution* in remote sensing is understood with respect to four qualities: spatial, spectral, radiometric, and temporal. *Spatial resolution* refers both to the smallest area that can be viewed by a sensor (i.e. the pixel, and the total area covered within one image, which is defined primarily by swath width). *Spectral resolution* refers to the spectral characteristics of the sensor, including the total number of bands, the bandwidths, and the locations of the bands along the spectrum. An example of spectral resolution is demonstrated in hyperspectral sensors that image

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<sup>79</sup> Concepts such as geosynchronous earth orbits (GEO), low earth orbits (LEO), pushbroom vs. whiskbroom scanning, and nadir viewing are not directly applicable to my research and discussions of these concepts can be found in remote sensing textbooks (Campbell 2007:99; Lillesand 2004:399).

more than 200 narrowly defined bands and thus have a greater or higher spectral resolution than systems such as Landsat TM, with 7 bands, or Landsat MSS, with 4 bands. *Radiometric resolution* refers to the ability of a system to record brightness levels. A coarse radiometric resolution can distinguish relatively few brightness levels (e.g., 128 to 256) while a system with high radiometric resolution (or sensitivity) might be able to distinguish as many as 1024, 2048, or even 4096 different brightness levels. *Temporal resolution* refers to the system's frequency to revisit an area. A system that revisits an area at close intervals provides a fine temporal resolution while infrequent revisit times result in coarse temporal resolution (Campbell 2007: 279-280).

These four qualities of resolution are important to my research in several ways. Spatial resolution is important because one objective is to identify and map archaeological features based on the appearance of above-ground architecture. There are two types of small features situated within my study area: 1) low walls constructed for tent dwellings that measure ca. 4 m by 6 m and 2) column bases that are <2 meters in size. The majority of architectural features in my study area are significantly larger (i.e., ca. 20 m to 200+ m). For identifying these, there are high-, medium-, and course resolution sensors. High-resolution sensors include those with 5 m resolution or better (such as IKONOS and Quickbird); medium resolution sensors range approximately from 20 to 80 m (such as SPOT and Landsat); and coarse resolution satellites provide resolutions greater than 80 m (such as MODIS<sup>80</sup> and AVHRR<sup>81</sup>). For my research, course resolution sensors are not useful for identifying or mapping features. However, both high- and medium resolution sensors are appropriate, depending on the task. High

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<sup>80</sup> Moderate Resolution Imaging Spectroradiometer (MODIS) by NASA

<sup>81</sup> Advanced Very-High-Resolution Radiometer (AVHRR) on the NOAA (National Oceanic and Atmospheric Administration) series of satellites.

spatial resolution facilitates identification of small features such as low walls and columns. It also facilitates mapping of detailed architectural features, such as smaller mud-brick structures on top of mounds (this is possible, but difficult and with less accuracy using a medium spatial resolution sensor). The spatial resolution within imagery provided in Google Earth varies based on the sensors providing the imagery. In my study area, the imagery is from SPOT. Both Google Earth and medium resolution sensors are suitable for mapping karez but inadequate for mapping detailed architectural plans. Low walls lack detail and cannot be mapped using the SPOT imagery.

Spectral resolution is relevant to my research because it permits analyses such as false color composites or application of a normalized difference vegetation index (NDVI). While a true color image displays the red, green and blue channels (RGB), a false color composite displays the infrared, green, and blue channels of an image.<sup>82</sup> This is represented as RGB-431. This means that for the red that channel 4 (infrared) is being displayed, for the green that channel 3 (blue) is being displayed, and for the blue that channel 1 (red) is being displayed. By creating a false color composite, spectral responses in the imagery may highlight changes in vegetation or soil content due to the presence of above-ground or buried archaeological features or even geological changes. NDVI is an analysis that tests vegetation vigor and, like false color composites, has the potential to detect archaeological features. For these two types of analyses, either the high or medium resolution sensors would be appropriate, but the high-resolution imagery would be slightly more accurate due to the smaller pixel size. NDVI analysis could be conducted using medium-resolution Landsat 5 imagery.

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<sup>82</sup> This is just one example of a false color composite, many others exist.

Imagery that has a high radiometric resolution is better suited for detecting color changes on the landscape or in features. A coarse radiometric resolution can distinguish relatively few brightness levels, (e.g., 128 to 256), while a system with high radiometric resolution (or sensitivity) might be able to distinguish as many as 1024, 2048, or even 4096 different brightness levels or colors (Campbell 2007:279-280). Both IKONOS and Quickbird have a high radiometric resolution and offer 11-bits per pixel.

Temporal resolution is important for answering some archaeological research questions. Sensors providing a fine temporal resolution would be beneficial for studying various types of impacts on archaeological features because several scenes of imagery at close intervals could be compared to determine when, and to what extent, there were impacts on the features. I use time-sequenced imagery but with a coarse temporal resolution that requires the combined use of aerial photography from 1980 and satellite imagery from 2008.

Sensors may be described as being either passive or active. A passive system is one in which instruments collect reflected solar radiation or emitted radiation from the Earth's surface while an active system is one that sends pulses from the sensor and reconstructs the imaged area based on the amount of time needed for the reflected signal to return to the satellite (Parcak 2009: 43). Passive forms of remote sensing include multispectral scanners, thermal sensors, passive microwave radiometers, and aerial photography (including both black and white and color infrared). Active forms of remote sensing (NASA 2011) include LiDAR and radar.

## 5.5 Strengths and Weaknesses of Remote Sensing Approaches

The strengths and weaknesses of remotely sensed data depend upon the user's perspectives and the intended purposes of the analysis. Remotely sensed data provides a means to conduct archaeological research without needing to be on the ground; this is useful in dangerous, war-torn countries as demonstrated by researchers who have conducted projects focused on Iraq (Hritz 2008; Stone 2008) and Afghanistan (Thomas, et al. 2008). Additional advantages include the fact that remotely sensed imagery reduces survey time in the field, thereby reducing labor costs and potential field hazards. Another strength is one's ability to use dimensions of temporal resolution to analyze landscape change over time. For example, short-interval repeat coverage is useful in cases in which an area is being monitored for looting (Contreras 2010; Contreras and Brodie 2010; Hritz 2004) or the effects of political strife (Satellite Sentinel Project 2011).

Weaknesses of remotely sensed data include accessibility or cost, requirements of training, a tendency to inhibit data collection on the ground, and the ethical issue of observing objects and people from the perspective of "the other." While some remote sensing imagery is available to the public, not all of it is free. It can be costly depending on imagery type, resolution, and the methods used to obtain it from archives or other sources. These costs can be prohibitive for most projects, especially archaeological projects operating on small budgets. Another disadvantage is that the imagery requires processing, and individuals working with it need to be trained in image processing and interpretation. However, this is less of a concern as projects become interdisciplinary,

incorporating a variety of specialists (e.g. archaeologists, geologists, botanists, and remote-sensing specialists).

## **5.6 Case Studies Utilizing Remote Sensing for Archaeology**

The case studies below were chosen because their study areas are located in arid environments in the Middle East and Central Asia, with an emphasis on Afghanistan. They focus on archaeological projects, considering location, technologies, and sensors used, as well as both successes and failures within the projects. The following projects will be at the core of the discussion: the use of Normalized Difference Vegetation Index (NDVI) to detect archaeological sites in the El-Markha Plain, South Sinai (Mumford and Parcak 2002); the use of Google Earth to identify previously undocumented archaeological sites in Afghanistan (Thomas, et al. 2008); the use of Landsat Thematic Mapper and aerial photography to identify relict features and to study their spatial relationships in southeastern Morocco (Lightfoot and Miller 1996); the study of the effects of modern agriculture and urban encroachment on the ancient city of **AL-RAQQA** in central Syria (Challis, et al. 2002-2004); and the documentation and modeling of looting patterns in southern Iraq (Hritz 2004).

### **5.6.a El-Markha Plain, South Sinai**

NDVI combines the infrared and red bands in a normalized ratio to measure vegetation vigor, which is associated with plant health. The presence of buried archaeological features affect how vegetation grows and its health (Parcak 2009: 92), therefore, the presence or absence of vegetation or changes in vegetation can indicate buried archaeological features. The formula

$$\text{NDVI} = (\text{NIR} - \text{Red}) / (\text{NIR} + \text{red})$$

produces a number ranging from -1 to 1. Values closer to 1 indicate the presence of vigorous green vegetation, while values closer to -1 indicate the landscape is closer to barren (Parcak 2009: 92). Mumford and Parcak (2002: 953) note that new approaches were needed in the identification of archaeological sites in this study area for two reasons: 1) because the El Markha Plain is divided by fenced petroleum compounds, making ground survey difficult or impossible and 2) because archaeological features in the region tend to be low-lying and are not easily viewed from the ground. Furthermore, research in other coastal environments, specifically Israel, has shown a positive association between the presence of archaeological sites and vegetation.

Research was undertaken at Site 346, a coastal site measuring 50 x 100 m and situated 1 m above the El-Markha Plain. NDVI was positive for the area of the site, while the surrounding plain produced mostly negative values. Results indicated that while the imagery was obtained during the drier summer months, vegetation was supported by sufficient sub-surface moisture. Surveys showed that archaeological sites in this area are situated near vegetated areas, wadi beds, and bases of hills (Mumford and Parcak 2002: 954). When tested through ground-truthing, this method of research proved successful in the identification of new archaeological sites.

Mumford and Parcak's use of NDVI analysis was an inventive means of identifying previous settlements and a methodology worth testing in my own research. For example, NDVI may help determine whether a karez is still functioning. This would be accomplished by identifying two karez, one in which the well shafts are clearly blocked on the surface and lead to a clearly abandoned settlement and one system that is functioning, as determined by open well shafts and the presence of agriculture in the

settlement. Testable examples identified through the use of Google Earth imagery include: an abandoned karez and a karez assumed to be functioning. One possible problem with the use of Google Earth is that the imagery is not up-to-date. For example, at the time I started this analysis, the imagery dated to December 2004. Therefore, while one karez may be functioning and the other abandoned as of the time of image acquisition, it is difficult to know without ground verification whether or not it is still active. As a result, it is important to utilize other sources of information, such as LiDAR data and orthorectified imagery.

#### **5.6.b. Southern Afghanistan**

Google Earth and remote sensing technologies can provide access to places otherwise not accessible for on-the-ground fieldwork. Researchers have used it successfully for the remote study of archaeological sites in Afghanistan (Thomas, et al. 2008). Few scholars (Contreras and Brodie 2010; Kennedy and Bishop 2011; Myers 2010; Thomas, et al. 2008) publish on research conducted using Google Earth, a trend that Thomas and colleagues (2008: 22) attribute to a preference for on-the-ground fieldwork. However, the lack of publication may be because Google Earth is used as the starting point of research and its significance diminishes once fieldwork is carried out and site maps or additional higher resolution imagery are acquired. That is, it is not used as the principal method for obtaining data.

Google Earth analysis conducted by Thomas and colleagues was based on a compiled database of known archaeological sites from Warwick Ball's 1982 *Archaeological Gazetteer of Afghanistan*. The project focused on both planned (**BUST** and **LASHKARI BAZAAR**) and unplanned sites (**QAL'A-I HAUZ**) in Helmand Province. With

the exception of **BUST**, most sites were easily viewed within a 100 m scene (Thomas, et al. 2008: 23-24). Google Earth only allows the image viewable on the computer monitor to be saved. Due to the spatial extent of **BUST**, the methodology was one of using increased resolution (zooming in with the software) to identify features, saving these higher-resolution images, and then stitching them back together using ArcSoft Panorama Maker. Since Google Earth imagery contains both high and lesser-resolution imagery, only scenes containing high resolution were selected for review in the study area of the Registan Desert and Ghur. The study area measured approximately 17 km<sup>2</sup> and was divided into 0.79 km strips that could be visually scanned; strip size was convenient since it easily fit the computer screen zoomed into 200 m in scale (Thomas, et al. 2008: 24). This method produced 1,830 Google Earth placemarks that represented potential archaeological sites. However, after another archaeologist crosschecked the sites (cross-checking criteria were not specified in the article), the number was reduced to only 451 possible sites, reflecting the removal of features that “were deemed to be of too uncertain function or date to qualify” (Thomas, et al. 2008: 24).

The research by Thomas and his colleagues is directly relevant to my own research because it presents a methodology for identifying and mapping archaeological features when it is difficult or impossible to conduct on-the-ground surveys. I have used Google Earth to compile a database of images of known archaeological sites in the provinces of Helmand and Kandahar in southern Afghanistan based on Ball's (1982) *Archaeological Gazetteer of Afghanistan*. Not all sites could be seen in the Google Earth imagery as a result of modern urban and agricultural encroachment, and, in some

cases, lack of suitable resolution, but Google Earth provided easy and free visual access to numerous sites and a means of becoming familiar with the landscape. Thomas and colleagues presented a methodology for extracting and saving Google Earth images, stitching them back together, and visually scanning the images to detect archaeological remains, a methodology that is testable and can be adopted and modified for my own work. Knowing where a site should be located but that cannot be viewed because of agricultural encroachment and perhaps overplowing (e.g. **TEPE BULAND** or **SAHIBZADA QAL'ACHA**) or because building materials may resemble the surrounding landscape (e.g. **DARWAZA** that consists of mounds in the desert) provides me with a jumping off-point, so to speak, to test remote sensing methodologies such as LiDAR. Furthermore, as will be seen below with Lightfoot and Miller's work in Morocco, the use of historical texts, including travel accounts from early researchers, may provide time-stamped locational data for interpreting karez systems.

### **5.6.c. Tafilait Oasis, Morocco**

Lightfoot and Miller (1996) utilized remote sensing as part of a multidisciplinary project at **SIJILMASSA** (AD 757-1393) in the Tafilait Oasis, in southeastern Morocco. The project focused on site morphology, spatial organization, utilization of resources, and settlement collapse (Lightfoot and Miller 1996: 78) based on oral histories, field survey, remote sensing, historical texts, and archaeological fieldwork (Lightfoot and Miller 1996: 87). Remote sensing sources included 1:50,000 maps of the Tafilait Oasis and 1:250,000 maps of the region, aerial photography, and Landsat TM (Lightfoot and Miller 1996: 87). The use of topographic maps aided in recording both contemporary features and ecological data. While both the aerial photography and the Landsat imagery

provided a landscape perspective, researchers used the former method as a means to confirm data/features acquired through the oral histories and from historical texts. The latter provided data on the spatial relationships (e.g. proximity of canals to settlements) as well as a means for processing calculations on the settlement as a whole. Additionally, the Landsat imagery illustrated landscape characteristics (e.g. arable vs. non-arable land), the locations of abandoned fields, and resource management (Lightfoot and Miller 1996: 87).

Aerial photography was useful to the project in a number of ways. Tone, texture, and pattern of the features on the landscape helped illustrate relic features, such as a buried settlement and walls (Lightfoot and Miller 1996: 92). One of the most important discoveries from the aerial and satellite imagery was that the Ziz channel (stream) was “too” straight in comparison to other nearby rivers, the Amerbouh and Rheris. This indicated that it had been diverted and redirected to serve the needs of ancient **SIJILMASSA** (Lightfoot and Miller 1996: 93). Interestingly, as one of their research objectives was to investigate reasons why the ancient city may have collapsed, Lightfoot and Miller (1996: 98) suggested that it was the increased use of *khattara* (i.e. karez) that in combination with population increase led to the collapse. This facilitated rural settlement and “made living apart from the city both thinkable and achievable.”

This research highlights how researchers from the disciplines of history, geography, and archaeology vary in their perceptions of “space,” “place,” and “landscape.” It also demonstrates the use of historical documentation (i.e. texts), oral histories, and remotely sensing to postulate the locations of features, the chronological order of events, and the relative timing of past construction. Oral histories are one of

the ways that a karez system may be dated without the benefit of on-the-ground research.

Lightfoot and Miller (1996: 84) suggest that it wasn't until the late 1300s or early 1400s that karez appeared in the landscape around **SIJILMASSA**. Since the city was abandoned in 1393, this represents the de-evolution of centralized control as karez were built and maintained by individual village settlements rather than by an authority in the city. This process may have also occurred in southern Afghanistan.

#### **5.6.d. City of al-Raqqa, Syria**

Challis and colleagues (2002-2004) conducted remote-sensing research using imagery that spanned roughly 60 years to investigate the site of **AL-RAQQA**. Remote sensing technologies included aerial photography (1924), Corona (1967), Landsat TM (1984) and Spot XS (1987). These sources provided environmental data and assisted with topographic mapping. The Corona imagery was low cost with high resolution in comparison to other high-resolution sources, such as IKONOS. Furthermore, it was effective given the arid environment and absence of cloud cover. Corona provided data on the site before the encroachment of modern development such as the construction of the Tabqa Dam and associated irrigation in the Euphrates and Balikha Valleys (Challis, et al. 2002-2004: 142). Although the Corona imagery is historic, it was cost effective. Challis and colleagues (2002-2004: 148) noted that having a remote sensing firm go out and take new aerial photographs specifically for the project would be costly and it would require more labor in photogrammetric processing. They scanned the Corona imagery,

utilized Adobe Photoshop to perform a histogram stretch,<sup>83</sup> altered the imagery with filters, imported it into ERDAS for final processing, and then ultimately imported it into GIS. Their results demonstrate that low-cost alternatives to satellite imagery can be effective in the study of past landscapes.

#### **5.6.e. Isin, Iraq (Corona)**

The methodology employed by Carrie Hritz (2008) was similar to that of Elizabeth Stone. Hritz's research set out to "document destruction of archaeological sites in one area of southern Iraq." Stone's research had several goals. She utilized Corona and SPOT imagery to demonstrate the ongoing destruction of **ISIN** in southern Iraq. She created a predictive model to demonstrate which areas were most likely to have destruction and to correlate the data with proximity to modern settlements. Additionally, her research set out to correlate archaeological sites with their occupational history to determine which sites were most likely to have been or to be looted as well as to identify previously unrecorded archaeological sites and map relict irrigation channels (Hritz 2008: 4).

Hritz (2008:3) noted that, while sites can be monitored using Google Earth, its imagery is updated only occasionally. Most imagery she used dated to around 2003 or 2004 and higher-resolution imagery was available only for a small portion of the alluvial plain. Hritz utilized 1960s Corona imagery and combined it with 1990s SPOT imagery and 2004 SRTM (Shuttle Radar Topography Mission) data as well as the most recent Quickbird imagery that was available at that time.

Hritz's research demonstrates the use of time-series imagery from three different

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<sup>83</sup> A histogram stretch allows the contrast and the range of colors to be corrected when an image is over- or under-exposed.

sources to study landscape change over time. Her research is similar to my study of Maywand District in that I have also used time series imagery to detect possible unrecorded archaeological sites and document recent landscape change. I have been able to adapt her methods for my own work.

## **5.7 Methods Used**

I undertook a variety of cartographic exercises and utilized different methods and image processing approaches to verify features identified in the remotely sensed data. My methods include the use of orthorectified aerial photography (USAGC 2008b), high-resolution Corona aerial photography (USEROS 1980), and a hillshade model derived from LiDAR data (USAGC 2008a). My primary published resource was the Archaeological Gazetteer of Afghanistan (Ball 1982), supplemented by other pertinent literature and Internet resources for the identification of feature types discussed in Chapter Six.

### **5.7.a Methods used: Mapping possible archaeological sites**

I obtained fixed-wing platform orthorectified aerial photography (USAGC 2008b) and LiDAR data (USAGC 2008a) for southern Afghanistan through The University of Kansas' Water Archaeology Landscape Culture (WALC) project. These data as acquired had been already processed in GeoTIFF format. Imagery contains high spatial resolution.<sup>84</sup> Using ArcGIS 10, I produced a hillshade model from the second (last) return digital elevation model (DEM) that was produced from the LiDAR data. Hillshade, or bare-earth, models that display an image devoid of vegetation, allowing topographic features such as hills and architecture, to be viewed can be produced from this data.

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<sup>84</sup> The exact specifications of resolution have been removed.

These models assist in the identification of archaeological features that are not discernible on the ground or that are covered under forest canopy (Gallagher and Josephs 2008: 188).

My methodology consisted of the following steps:

1. To test the identification of archaeological sites (Hypothesis 1), I overlaid the shapefile of known archaeological sites on top of the hillshade model.
2. I then analyzed this image for anomalies that represented architectural features such as mounds, tells, and historical (i.e., not modern) structures.
3. I created points and polygons for features that had not previously been identified. The polygons provide approximate areas for the features.

#### **5.7.a.1 Identification**

In identifying possible features, I used the following steps:

1. I identified anomalies in the hillshade imagery. I accomplished this by visually scanning each of the four scenes that comprise the study area.
  - 1.a. Using ArcGIS, I created points for each feature and attribute data for the features.
  - 1.b. I reviewed orthorectified imagery to determine whether the anomalies identified in the hillshade model are also visible in these technologies and noted this in the attributes of the created point file.
2. I visually scanned the orthorectified imagery to determine whether anomalies are present that were not identified in the hillshade model. This served as a “double check.”

With this information, I produced a GIS database of features named “Features\_Identified.” I verified features through an extensive literature review. I displayed the data on a map of the study area and noted observations made regarding these features. This database has the following attributes:

- **FID**, automatically generated by ArcGIS
- **Shape**, automatically generated by GIS
- **ID**, a number provided by this researcher to identify the feature
- **Province**, the study area is located in one province, Kandahar
- **District**, the study area is located in one district, Maywand
- **Village**, the village associated with the feature
- **Feature**, used to identify whether the feature is a structure, scars on the landscape, mound or walls
- **Desc\_**, provides a description of the feature

### 5.7.a.2 Verification

Because archaeological fieldwork in Afghanistan is not feasible due to the current security climate, other methods were necessary to verify the features identified. This phase involved several steps:

1. I conducted a literature review with Volume II of *The Archaeological Gazetteer of Afghanistan* (Ball 1982) as the primary source.
2. I created a gazetteer of features that includes their locations, sizes, images from the orthorectified imagery, contour lines, hillshade model images, and drawings, as well comparisons with known archaeological sites.

## 5.7.b Methods used: Identifying and mapping karez systems

I identified, mapped, and categorized karez systems using orthorectified aerial photography (USAGC 2008b) acquired through The University of Kansas' Water Archaeology Landscape Culture Project focusing on southern Afghanistan and a GIS.

### 5.7.b.1 Identifying karez systems

I based my categorization on whether the individual vertical access shafts of the karez appeared open or blocked. Shafts that appeared blocked on the surface and lead to clearly abandoned settlements I defined as "inactive"; where those systems that appear to be functioning, as determined by open well shafts and the presence of agriculture in the settlements, I defined as "active" (Figure 12).

### 5.7.b.2 Mapping karez systems

Using ArcCatalog, I created a point file ("karez\_ident") to map karez systems in the study area. This file has the following attributes:

- **FID**, automatically generated by ArcGIS
- **Shape**, automatically generated by GIS
- **ID**, obtained from a previous mapping exercise utilizing Google Earth to identify karez systems
- **Province**, the study area is located in one province, Kandahar
- **District**, the study area is located in one district, Maywand
- **Village**, to record the village supplied by the karez
- **Active**, used to identify whether the karez is active or inactive: "0" was used to indicate inactive systems, "1" was used for active systems, and "2" was used for those systems that are undetermined

I created a polyline file, “karez\_lines,” in ArcCatalog to map karez systems in the study area. This file contains the above noted attributes from the file “karez\_ident” with the addition of:

- Length, generated automatically in ArcGIS

### **5.7.c Methods used: NDVI analysis**

I identified and acquired Landsat 5 imagery then processed it to conduct an NDVI analysis. I overlaid the karez line mapping results on top of the NDVI results to determine whether NDVI could be used to determine whether karez were active or inactive systems.

#### **5.7.c.1 Identification and acquisition of Landsat imagery**

The selection of Landsat scenes depended greatly on the seasons and crops grown in Afghanistan. Landsat scenes focused on spring, summer, and fall. Bowlby (1978: 28) notes that wheat, barley, and lentils are grown in the spring, while beans and maize are grown in the fall. Accurate current agricultural data is lacking and even Qureshi (2002: 5) cites production and crop yields from 1978, so this has conditioned the quality of interpretation.

#### **5.7.c.2 NDVI Processing and Integration with Karez Data**

Landsat imagery is readily available and free to download through the USGS website.<sup>85</sup> I chose Landsat 5 Thematic Mapper imagery over Landsat 7 to insure using a recent, quality image<sup>86</sup> (i.e., 2010 and 2011). I downloaded Landsat 5 TM images from the USGS website in GeoTiff format and processed for NDVI using ArcGIS 10 on

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<sup>85</sup> <http://edcsns17.cr.usgs.gov/NewEarthExplorer/>

<sup>86</sup> In May 2003, the Scan Line Corrector (SLC) on Landsat 7 failed, thereby reducing imagery quality (Campbell 2007:161)

December 7, 2011. Based on cloud cover, image sharpness, and image accessibility,<sup>87</sup> the following scenes were downloaded and processed:

- Spring: June 21, 2010
- Summer: September 9, 2010
- Fall: November 15, 2011

I used the Image Analysis menu in ArcGIS, to select Landsat bands 3 (red) and band 4 (near infrared) and then selected the “run NDVI function.” I created three maps of the study area illustrating the NDVI results for spring, summer, and fall. Once I created the maps from each of the three seasons of the NDVI results, using ArcGIS I overlaid the karez line data and produced another three maps for each of the three seasons noted above to analyze.

#### **5.7.d Methods used: Georeferencing Corona**

The methodology of georeferencing Corona imagery (USEROS 1980) and analyzing villages situated within the study area included three primary steps: 1) identify and acquire Corona imagery, 2) georeference the imagery, and 3) analyze Corona imagery and the orthorectified imagery dating to 2008 using GIS data of known settlements and karez systems.

##### **5.7.d.1 Identification and acquisition of Corona imagery**

The selection of Corona imagery depended on three factors: 1) sufficient ground resolution, 2) the absence of cloud cover, and 3) the date of imagery acquisition. The Corona scene selected for this study dates to July 20, 1980 and was downloaded from

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<sup>87</sup> Images associated with the fall season from 2010 were not available for download, instead for those scenes I would have had to submit an order for processing.

the USGS website<sup>88</sup> on January 23, 2012. An earlier scene was preferred for this project and two scenes from June 17, 1964 and August 21, 1964 were reviewed. However, the resolution was not sufficient to identify and map karez. A handful of other scenes were available. Some scenes did not include the entire study area, while other scenes were from winter and spring months. The July 20<sup>th</sup> scene was chosen for its resolution, lack of cloud cover, and while the scene was acquired during the summer, it was the best option available to conduct this study with the orthoimagery that was acquired during the fall season in October.

#### **5.7.d.2 Georeferencing**

I used a total of 14 points to georeference the Corona imagery (USEROS 1980) to the orthorectified imagery (USAGC 2008b). This produced a root mean square error (RMSE) of 0.928 (Figure 13). The RMSE represents a numerical estimate of the goodness of fit of a georeferenced dataset (Chang 2006). As such, the lower the RMSE, the better the fit of the imagery source data to the reference data and in this case, the orthoimagery was used to georeference the Corona. I accomplished this by identifying ground control points (GCPs) that were visible in both sources of imagery, such as road intersections, building corners, and karez vertical access shafts or surface canals. After the scene was georeferenced, I rectified it using nearest neighbor pixel resampling type. This was done so that the Corona scene could be brought into the work file containing GIS layers created for the project, such as karez points, karez lines, villages, etc.

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<sup>88</sup> <http://edcsns17.cr.usgs.gov/NewEarthExplorer/>

## **5.8 Chapter Summary**

This chapter reviewed literature focusing on the use of remote sensing technologies for archaeological research in arid environments and provided a brief history of remote sensing for archaeological applications. From these sources, I selected methodologies applicable for studying the archaeology and the karez based on the successes of similar research projects in Central Asia. I presented these remote sensing methodologies, discussing how particular sources of imagery are relevant, how I acquired the imagery and processed it, and how I mapped possible archaeological features and karez systems. The following chapters present the results of utilizing remote sensing technologies to study the archaeology and traditional water systems within the study area.

## **VI. CHAPTER SIX: INVENTORY AND ANALYSIS OF ARCHEOLOGICAL FEATURES**

### **6.1 Introduction**

This chapter addresses the results of testing Hypothesis 1 and demonstrates through the creation of a gazetteer how remotely sensed data can be used to identify possible archaeological features in the Maywand study area. Although many of the features have relatively clear signatures, their identifications remain tentative until some form of ground-truthing can be undertaken. It is probable that sites dating as early as the Paleolithic exist in the southern part of the country. Rock shelters and open-air sites exist in the north. However, open-air sites that do not leave surface remains or a signature that can be detected in the remote sensing imagery cannot be detected. Identification and classification of feature types (i.e., mound, qala, cemetery, etc.) in the study area benefited from comparative data in publications that describe previously documented archaeological features and sites. Because it is often difficult and dangerous to conduct research during times of conflict, this remote sensing method provides a case study of how to conduct a preliminary archaeological investigation when fieldwork is not possible.

### **6.2 Inventory**

**Hypothesis 1: Remotely-sensed data can be used to identify both documented and previously undocumented archaeological sites and to map these features.**

My results indicate that this hypothesis is supported. Using orthorectified imagery (USAGC 2008b) and a hillshade model (derived from USAGC 2008a), I was

able to identify 107 possible archaeological features in the Maywand District study area (Table 1, Figure 14). These include 46 mounds and tepes (or *tells*), 6 qalas, 12 circumvallation features, 12 undetermined structures, 9 square features, 9 unidentified structures, 12 scars on the landscape, and one other feature (Figure 15). Other features, such as cemeteries, have been classified differently since they appear in conjunction with other features, such as mounds. Data on these features are compiled in the *Archaeological Gazetteer of Maywand District, Kandahar Province, Afghanistan* (Appendix C).

**Table 1. Distribution of features identified by type**

<b>Feature Type</b>	<b>Total</b>
Mounds	37
Tepes	9
Qalas	6
Circumvallation Features	12
Undetermined Structures	12
Square Features	9
Unidentified Structures	9
Scars	12
Other	1
<b>Total Features</b>	<b>107</b>

### **6.3. Feature Classification**

An application of remote sensing techniques is generally followed by on-the-ground fieldwork (Bewley, et al. 2005; Crutchley 2006; Deveraux, et al. 2005; Gallagher and Josephs 2008; Harmon, et al. 2006). At the start of this project, I knew that the field verification of features would not be immediately feasible. As a result, I needed to develop a methodology for identifying and classifying anomalies (i.e., possible

archaeological features) in remotely sensed imagery. I then catalogued and identified these features in a gazetteer of the study area that: 1) facilitates data analysis and 2) makes the results readily accessible to other scholars. The *Archaeological Gazetteer of Afghanistan* (Ball 1982) and other resources on archaeology (Ball 2008; Dupree 1973; Dupree and Howe 1963; Hammond 1970; Sarianidi 1976) and architecture (Barfield 2010; Hallet and Samizay 1980; Knobloch 2002; Samizay 2003; Szabo and Barfield 1991) of Central Asia provided meaningful data that assisted in classifying these features. My own contribution is an augmented archaeological gazetteer of the Maywand District study area.

### **6.3.a. Mounds and Tepes**

Forty-six of the features I identified are either mounds or tepes. There are 37 mounds (Figure 16) and 9 tepes (or *tells*) (Figure 17). Elevated areas on the landscape are chosen as occupation areas and/or used as foundations for mud-brick structures. A long cycle of occupation, with possible episodes of abandonment and associated demolition and rebuilding, contributed to the accumulation of successive layers of cultural features on these areas. Structures constructed on top of previous occupations collapse and erode at different rates, creating irregular surfaces. Over time, this process creates a stratified occupation of features and results in either a mound or a tepe (Hammond 1970: 440-441; Rosen 1986: 9). I use “mound” as a broad category when the traces of mud-brick structures are not discernable. I use “tepe” when an obvious mud-brick structure is visible on the surface of a mound. Due to patterns of erosion, an abandoned town may appear as several small mounds (Rosen 1986: 9). Both mounds and tepes tend to be round or oval, but not square or rectangular. Square or

rectangular mounds are apparently ruined structures such as qalas or caravanserais and I will discuss these as a separate category (i.e., “square/rectangular features”). While I categorize a feature as a mound, it could still contain buried occupational levels that may or may not include mud-brick structures. Therefore, what I classify as a mound may actually be a stratified tepe.

Identifying the periods of occupation of mounds and tepes in the study area is difficult without conducting on-the-ground research, but these occupations can date as early as the Neolithic and as late as the Islamic Period (ca. AD 900 – 1500). Mounds in northern Afghanistan date to the Neolithic at the site of **TASHKURGHAN** (Dupree and Howe 1963: 2). Mud-brick structures date as early as the Medieval or early Historic Period (i.e. the Iron Age or Kushan Period).

Two examples of mud-brick structures on elevated surfaces that range considerably in date are found at two previously documented sites also situated in Afghanistan but outside of the study area: **DASHLI 1** and **DANISTAMA**. **DASHLI 1** is a mound containing a rectangular structure complete with defensive walls and circular towers and dates to the Late Bronze Age (Ball 1982: 84, 432; Sarianidi 1976: 50, 55). **DANISTAMA** is a mud-brick structure situated on a masonry foundation that dates during the Ghaznavid-Ghurid Period (11<sup>th</sup> – 13<sup>th</sup> century) (Ball 1982: 80). A comparison of **DASHLI 1** and **DANISTAMA** illustrates that debris foundations date earlier than masonry ones and knowing the type of foundation could provide one way of dating these features.

The type, size, and shape of Feature 26 (Figure 18, *top image*) resembles one at **DEH MORASI GHUNDAI** (Figure 18, *bottom image*), also in Kandahar Province, although Feature 26 is slightly smaller. **DEH MORASI GHUNDAI** and **MUNDIGAK** in southeastern

Afghanistan date to the Chalcolithic period and are similar to contemporaneous sites in the Indus Valley (Ball 2008: 45; Dupree 1973: 266), with which they have possible connections (Dupree 1963: 115). **UINA QARA** is a Bronze Age site in northwestern Afghanistan approximately 64 miles outside of Mazar-i-Sharif. It contained surface evidence (i.e., painted sherds) similar to **DEH MORASI GHUNDAI** and **MUNDIGAK** that suggests the possibility of long-distance trade with these two sites (Dupree and Howe 1963: 2). We would expect to find other sites within the region and the study area—perhaps Feature 26—to have connections with either the Indus Valley or Seistan.

### **6.3.a.1. Reused Mounds: Cemeteries**

There are three mounds that have been reused as cemeteries. While there are numerous cemeteries in the study area, I mapped only these three because they are situated on top of mounds. If the cemeteries are modern, their placement on or close to a mound is an example of the reuse of space. The placement of a cemetery on a mound may suggest that the location or mound is significant to the people who placed burials there. It may also be a reuse of space that cannot be used for other activities since all irrigable land is used for agriculture (Hallet and Samizay 1980: 127).

Cemeteries can be identified through comparisons with photographs on the Internet and in the archaeological literature (Dales 1972: 31). I was able to identify sites as cemeteries in the orthorectified imagery and hillshade model using a Google search for images of cemeteries in Afghanistan.<sup>89</sup> A cemetery photographed in Kandahar in 2007 (International Council on Security and Development 2008-2010) and a cemetery within the study area demonstrate construction of individual grave markers from rocks

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<sup>89</sup> Web addresses include [http://www.icosphoto.net/kandahar\\_taliban\\_graveyard/iframe\\_2](http://www.icosphoto.net/kandahar_taliban_graveyard/iframe_2) and <http://framework.latimes.com/2011/01/28/afghanistanaerials/#/11>.

and rubble (Figure 19). I was also able to confirm cemetery features using the archaeological literature. **GODAR SHAH**, a site with a shrine first discussed in 1896, was visited in 1971 during an archaeological reconnaissance in southern Afghanistan (Dales 1972). Dales (1972: 31) describes it as a small mound containing a mud-brick building with a grave covered with stones and other objects as well as wooden poles with “bits of tattered cloth and a crude metal bell” and notes that covering graves in this manner is common practice in the Muslim world.

### **6.3.a.1. Reused Mounds: Modern Impact**

There are three mounds that have been reused for modern agricultural and domestic purposes. Feature 43 appears to contain a water retention pond that may be associated with a covered well (Figure 20). Feature 10 and Feature 31 both have remains of modern mud-brick structures, but Feature 31 has two modern purposes. It also contains a grave.

### **6.3.b. Qalas**

There are two features I have identified as qalas (Feature 32 and Feature 68) (Figure 21) and there is another four qalas that are classified differently and are discussed below. A qala<sup>90</sup> is essentially a fortified castle, referred to as “the fortress house” (Hallet and Samizay 1980: 123) or a “fortified farm compound” (Szabo and Barfield 1991: 161). It is a self-contained structure that provides “shelter and protection for an extended family, their farm animals, and the provisions necessary for survival” (Szabo and Barfield 1991: 163). The qala is primarily associated with Pashtuns of

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<sup>90</sup> Spelling variants include kala and qaleh (Knobloch 2002:172); and qal’ah (Dari) and kalah (Pashtu) (Dupree 1973:132). In Iran these fortified structures are qal’eh (Farsi).

southern and eastern Afghanistan. However, groups such as the Hazaras in the central part of the country also use this architectural style (Hallet and Samizay 1980: 123; Samizay 2003: 451; Szabo and Barfield 1991: 161-162).

Qalas are square or rectangular and vary in size. On average, a qala measures ca. 40 m on a side but can range from 20 m to 80 m on a side (Hallet and Samizay 1980: 123; Samizay 2003: 451; Szabo and Barfield 1991: 161). A qala can be small and house an extended family or large and house a prominent landlord, his extended family, and his workers (Hallet and Samizay 1980: 123). Hallet and Samizay (1980: 137) note that one qala in Shewaki near Kabul provides housing for nine families and estimate that more than 100 occupants live inside its walls. These tall walls made of mud bricks are called *pakhsa* (Hallet and Samizay 1980: 129; Szabo and Barfield 1991: 137)

One of the visible characteristics of a qala fortress is the presence of corner guard towers. A qala fortress most commonly has four towers, but larger examples can have six or nine, one at each corner and the others evenly distributed along the outer walls (Samizay 2003: 452; Szabo and Barfield 1991: 161). Hallet and Samizay (1980: 129) note that the corner towers stabilize the long walls. The number of towers associated with a qala fortress is directly related to its prestige value (Samizay 2003: 452). I have yet to find a source indicating when the earliest qala form first appears on the landscape. Most qalas date to the Medieval Islamic period, though some have evidence for earlier occupations. They continued to be built until at least the mid-19<sup>th</sup> century and they continue to be built today. For example, Hallet and Samizay (1980: 137) note that a qala in Shewaki was built in 1860 during a time when tribal warfare was

prevalent. Evidence suggests that these types of structures, and their settlement layout, may have originated in Iran<sup>91</sup> (de Planhol 1958; English 1966: 19).

Qalas in the archaeological record include examples at **ABU HURAIRA** (Kāfir Qal'a), **JABAR TEPE**, and **DILBARJIN** (Figure 22). At these sites, the qalas resemble the features in the study area. They also demonstrate the continuity of use of this kind of fortified structure. The example at **ABU HURAIRA** (Kāfir Qal'a) is described as a fortified structure with ramparts made of mud-brick. This site is associated with the Hephthalite/pre-Mongol Islamic (6<sup>th</sup> – 12 century) and Ghaznavid (1000-1050) periods (Ball 1982: 28, 417). **JABAR TEPE** is an urban fortified site complete with fortifications around a central keep that dates to the Early Islamic Period (10<sup>th</sup> – 13<sup>th</sup> century) (Ball 1982: 131, 449). **DILBARJIN** is a large urban site with a fortified enclosure that has a citadel in the center as well as unfortified urban areas and mounds. It dates to the Achaemenid (6<sup>th</sup> – 4<sup>th</sup> century BC), Kushan (1<sup>st</sup> – 3<sup>rd</sup> century), and Kushano-Sasanian (to the first half of the 5<sup>th</sup> century) periods (Ball 1982: 91-92, 435). The qalas identified in the study area are interesting in that while some are in ruins others have been reused for agricultural purposes or are modern features that are constructed to resemble historic qalas.

#### **6.3.b.1. Reused Qalas: Walls for Agricultural and Modern habitation**

There are two qalas in the study area that are currently used for agricultural purposes (Feature 24 and Feature 100) and one qala that contains evidence of modern houses (Feature 29) (Figure 23). Feature 24 appears to be older than Feature 100

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<sup>91</sup> European or crusader castles differ from the Muslim and Byzantine tradition of castle building (Kennedy 1994:17). See below for a discussion of the qala as the core of the settlement as seen in Kirman Iran, and how these structures are associated with karezes in the study area.

because of its crumbling walls. It is unclear whether Feature 100 was originally constructed as a qala for habitation and then repurposed for agriculture. It is also unclear whether its three corner towers are operational. Furthermore, the walls do not show signs of disrepair and are either well maintained or have been newly constructed. Rather than being an authentic qala, this feature may actually represent an orchard with tall walls that were constructed in the style of a qala with corner towers to enclose the orchard. These towers, whether functional or not, may be an architectural necessity for constructing tall walls (Hallet and Samizay 1980: 129; Szabo and Barfield 1991: 137). Feature 29 is a qala that shows signs of having modern household constructions on top, in addition to roads.

#### **6.3.b.2. Qala Walls: Continuation of Style**

Feature 64, may represent a continuation of the qala morphology (Figure 24). Its walls, complete with towers, resemble qala walls but there is modern construction within them. The layout of this feature is in the form of two rectangles that connect at the point where the northeast and southwest corners of each meet, allowing access to both areas. This feature has six towers, but it is unclear whether they are functional. They do not resemble the traditional circular towers seen in other qalas, such as Feature 32 or Feature 100. Feature 64 may be modern, but it demonstrates the continued use of specific architectural features.

#### **6.2.c. Square/Rectangular Features**

I have identified nine square features in the study area that appear to be ruined and/or buried structures (Figure 25). These features are square or rectangular in shape and have walls with 90-degree angles. Buildings constructed with a square layout

include qalas, caravanserais, and religious buildings such as mosques. Mosques, a form of Islamic architecture, are generally constructed with minarets (Knobloch 2002: 57). Minarets may survive the destruction of a mosque, such as the minaret still standing at JAM (Knobloch 2002: 127). The four minarets<sup>92</sup> associated with the Musalla complex<sup>93</sup> dating to the Late Islamic Timurid Period (ca. AD 1380 – 1500) in Herat stood intact until three of them collapsed in earthquakes—two in 1931 and one in 1951 (Dupree 1973: 318; Knobloch 2002: 133). There are two features (Feature 39 and Feature 48) in the study area that are associated with a smaller debris pile that might represent a collapsed minaret. These features could also be caravanserais. They could be fortified and may have features such as corner towers and bastions (Knobloch 2002: 57,169; Stewart 2006: Part Two, Caravanserai, Whose Portals, Paragraph 9). On-the-ground data are needed to determine their associated time periods.

#### **6.3.d. Undetermined Structures**

There are 14 features that I classified as undetermined structures (Figure 26). This category includes structures that are not elevated mounds but that exhibit built construction. It has not been possible to correlate these features with known archaeological features using only remotely-sensed data and library resources. Their identification will require visual inspection, mapping, and archaeological surveying and testing. There are 13 features in the study area that show signs of disturbance and possibly looting through the digging of pits and trenches. Disturbed features include

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<sup>92</sup> Knobloch (2002:133) notes that more minarets, as many as 20, may have been associated with the site and the Friday Mosque.

<sup>93</sup> Road construction around the Musalla Complex currently threatens the remains of the site. See Chapter Two.

Feature 5, Feature 13, Feature 19, Feature 27, Feature 35, Feature 38, Feature 39, Feature 49, Feature 50, Feature 53, Feature 72, Feature 84, and Feature 87.

#### **6.2.e. Circumvallation Features**

A “circumvallation” is a wall or outer wall (Possehl 2002: 82). This term has been used by archaeologists for walls in the Middle East (Keall 1984; Stein 1936) and I use it to categorize enclosing wall features of unknown function. I have identified 11 circumvallation features in the study area. Six are circular and five are square (Feature 27). These walls may be associated with citadels or forts, but this cannot be verified. Hence the neutral term “circumvallation.”

#### **6.3.f. Unidentified Structures**

I identified eight structures in the study area that do not correspond to other features in southern Afghanistan. These are divided into categories of Unidentified Structure A (1), B (1), and C (6). Feature 2 and Feature 12 are categorized as “Unidentified Structure A” (Figure 28) and “Unidentified Structure B” (Figure 29), respectively. These do not resemble any other structures identified in the study area, although Feature 12 appears pyramidal in shape but may represent a qala.

Seven features are classified as “Unidentified Structure C.” These are interesting in that all contain a section that resembles a “tail” or semi-circle (Figure 30) and are associated with wells. All but one of the features appears in the southwestern corner of the study area and are situated at roughly even distances from each other (Figure 31).

### **6.3.g. Scars: Nomadic Encampments and Unidentified**

I identified 12 features as “scars” in two categories: nomadic encampments and unidentified scars. These are considered to represent relatively recent human activity. Nine may represent campsite remains from nomadic encampments or semi-sedentary peoples (Figure 32, left image) while the remaining three contain square scars of unknown function (Figure 32, right image). These latter cannot be associated with nomadic encampments or semi-sedentary groups, although in one instance (Feature 25) square scars appear in conjunction with the remains of nomadic encampments (Figure 33). Two factors contribute to this interpretation: 1) the visual similarities of inhabited locations in the orthorectified imagery and 2) the presence of low walls used for tents and huts, serving either as a foundation or to make the living conditions more comfortable (Dupree 1973; Hallet and Samizay 1980; Szabo and Barfield 1991).

Visual inspection of orthoimagery confirms that the “scars” (Figure 34, top image) appear in conjunction with occupied nomadic encampments (Figure 34, bottom image). Since there are various features associated with the nomadic encampment, it is possible that some of these are low walls are those that are used to build small huts. Nomadic encampments are palimpsests that may be seasonally reused and associating a time period with unoccupied remains is difficult. Orthoimagery from tight time frames, such as monthly or even yearly images, may provide data for determining the presence of tents and/or gradual construction of low walls in these areas.

Dupree (1973: 178) notes that some nomads became semi-sedentary during the encroachment of the Afghan government and pioneer settlers in formerly nomadic regions of northern Afghanistan. When this happened, individuals that stayed behind in

encampments built short *pisé* walls outside the edges of the tent, creating a more permanent structure. These walls grow taller over time. Eventually, the tent was removed and a roof placed on top of the walls (Dupree 1973: 179). I identified three structures that utilize low walls (ca. 25-30 cm in height). These include three different types of huts (Hallet and Samizay 1980: 53-73; Szabo and Barfield 1991: 99-107).

Using data for a Qawwal<sup>94</sup> camp located near Kabul, Hallet and Samizay (1980: 53) describe a similar evolution of housing that begins with a pup-tent, followed by a low (25 cm) perimeter wall. Over time, the wall grows taller and the tent, draped over the walls, serves as a temporary roof. Eventually, a mud roof replaces the temporary one. As the living spaces continue to grow, the dwelling becomes a complex of small huts or rooms that are used for different purposes, such as cooking (Hallet and Samizay 1980: 53-73).

*Kodai* are ovate-oblong huts used by Pashtuns that are semi-sedentary pastoralists and traders. One encampment studied was situated in the foothills of Basawal, southeast of Jalalabad in the northeastern part of the country (Szabo and Barfield 1991: 101). *Kodai* construction begins with a low (ca. 30 cm) ovate-oblong clay wall. A frame is constructed using two center poles and a ridgepole and then 24 poles are inserted into the low clay wall and tied to the ridgepole. Walls are constructed from bundles of straw tied to the frame. When the structure is abandoned, only the center poles and ridgepoles are taken for reuse (Szabo and Barfield 1991: 99-101).

*Kodik*, another type of ovate-oblong huts, are used by the Baluch, Pashtuns, and Brahuis along the Helmand River in southeastern Afghanistan (Szabo and Barfield

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<sup>94</sup> Migrant workers (Hallet and Samizay 1980:53). Also spelled as Qawals (Samizay 2003:451).

1991: 103). These are constructed of tamarisk. A low (ca. 25 cm) wall is built along the inside wall to keep out insects and snakes (Szabo and Barfield 1991: 103).

The three types of huts noted above are not geographically specific. Szabo and Barfield (1991: 7) identified 44 distinct types of rural housing structures and provide distribution maps representing the geographical extent of each type. In two cases, there appear to be scars associated with nomadic encampments on both sides of riverbanks and/or channels. Feature 7 is situated south of a river channel while Feature 6 is situated on the north bank of the same channel.

### **6.3.h. Other architecture**

There is other architecture that I identified in the southwest portion of the Feature 7. This “other architecture” may be a group of four columns or pillars<sup>95</sup> (Feature 7a) (Figure 35) (Omar Sultan, Personal communication 2013). A close visual inspection of the imagery suggests that they are similar to those found at **TEPE DURMAN** (Mizuno 1968: 95, Plate 3.1) and **SURKH KOTAL** (Schlumberger 1953: 236; 1955: 86; 1961: Plate IIIa). A stain, possibly from a structure or building, is visible around the perimeter of the columns that measures ca. 5 m<sup>2</sup>, a measurement similar to stains found at **TEPE DURMAN**<sup>96</sup> (Mizuno 1968: 99) and **SURKH KOTAL** (Schlumberger 1953: 236; 1955: 86; 1961: Plate IIIa). Both sites are located in northern Afghanistan and date during the Kushan and Kushano-Sassanian Periods ca. 2<sup>nd</sup>-4<sup>th</sup> century AD (Ball 2008: 266; Mizuno

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<sup>95</sup> There are also sheep or animals visible in the imagery and it is also possible that these possible columns may not be architecture but instead associated with farming or animal husbandry.

<sup>96</sup> Mizuno does not indicate how the measurements were taken. Furthermore, only three columns were located at Tepe Durman.

1968: 236; Schlumberger 1955: 86). Feature 7a may therefore date during the Kushan and Kushano-Sassanian Periods (ca. 2<sup>nd</sup>-4<sup>th</sup> century AD) (Figure 36).

#### **6.4 The Qala and The Karez**

One of the questions I investigated was the possibility of a direct relationship between qalas and karezes because water and a reliable water supply are necessary for survival. The absence of rivers in close proximity to qalas suggests that they receive water by another water source, such as karezes or wells. However, evidence from Kirman City, Iran and near Kabul, Afghanistan suggests that in these locations there is not a relationship between qalas and karezes for the use of domestic water (English 1966; Szabo and Barfield 1991). To analyze these particular features in their historical and regional contexts, I used comparative data from associated karezes and qalas in Kirman City, Iran and near Kabul, Afghanistan.

There is some archaeological evidence for surface canals, such as those used to divert river water at **LASHKARI BAZAAR** (Fischer 1978: 311) and on the plain adjacent to **AĪ KHANOUM** (Ball 2008: 148-150). However, there is little data to clearly associate karezes with known archeological sites. A number of qalas in the study area run in close proximity to karezes, but there is no evidence—such as surface canals or other features—to indicate that these systems supplied water to qalas (Figure 37).

As noted above, a qala is a fortified self-contained structure (Szabo and Barfield 1991: 163) and evidence suggests that these structures, and the settlement type associated with them, may have originated in Iran (de Planhol 1958, English 1966: 19). English (1966: 19) provides a discussion of settlement formation in Kirman City, Iran, and discusses the qala as a fortified structure. In Iran, the qala served as the core of

the settlement and wells provided water for domestic use for the qala (English 1966: 19). The settlement also consisted of single-storied houses constructed of mud and enclosed within the village walls. Scholars (de Planhol 1958; English 1966: 19) note that this type of settlement originated in Iran then spread to the Middle East and Central Asia.

Multiple case studies from near the capital of Kabul in northern Afghanistan indicate that qalas vary in size. They could house a single extended family, several extended families, or an extended family and its associated non-related agricultural workers (Hallet and Samizay 1980: 123, 137). Qalas are associated with *khan*<sup>97</sup> (wealthy landowners) and constructed on or adjacent to the agricultural fields they own. Peasants or tenant workers perform related agricultural tasks (Hallet and Samizay 1980: 125). Refer to Chapter Four for discussion on social heterarchy and hierarchy.

Research based on multiple case studies in northern Afghanistan also suggests that a qalas usually had an associated well. Szabo and Barfield (1991: 163) note that locating a water source is important in site selection for the construction of a qala. Citing a qala situated in the Maiden Valley some 40 km southwest of Kabul, Szabo and Barfield (1991: 163) note, “a water point is frequently central to the qala court” although, it is common to find it “immediately outside the single entry gate.” The pattern of having a well situated inside the qala walls or right outside the qala gates is consistent with data from my study area based on evidence in the orthoimagery. There are three examples. In each, the qalas vary.

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<sup>97</sup> In some cases the village chief (*malik*) might be the master of the qala (the *khan*) (Hallet and Samizay 1980:127).

#### **6.4.a Feature 24**

There appears to be a hole that may be an open well inside the walls in the top left corner of a qala represented by Feature 24 (Figure 38). However, there is no surface canal or evidence of another method, such as tubing, that would transport the water from this possible well to the orchard/fields.

#### **6.4.b Feature 29**

It is unclear where the water sources are for the residences associated with the qala represented by Feature 29. There may be two covered wells visible in the top right corner (Figure 39, a) and bottom left corner (Figure 39, b) of the qala walls. The possible covered well in the top right corner (Figure 40) is associated with a surface canal but the canal does not lead to a structure or to agricultural fields. The other possible covered well in the bottom left corner is also associated with a surface canal (Figure 41). This canal leads to a structure that may be a residence. There is also a hole associated with the surface canal. This hole may represent a reservoir for underground water storage.

#### **6.4.c Feature 100**

Feature 100 contains an unidentified object in near the water retention pond that is visible in the right side of the image (Figure 42). This may be a covered well. However, since it is located in close proximity to the retention pond it appears as if there may be a surface canal, or canals, that enter the qala walls under the southeast wall. These surface canals run through the retention pond and into the fields within the qala walls. It is unclear whether this is a functioning surface canal because it is smaller than the canals located nearby.

#### **6.4.d Feature 32**

Feature 32 is another qala, but it does not appear to be in use (Figure 43). Here are clearly several caved-in sections of roofing. It is not clear whether there is a well situated outside the qala walls. There is one unidentified object that resembles a hole in the ground and could potentially be a small well. However, it could also be the result of urban activity (i.e., the moving of land, digging, etc.) in the area, since modification occurs in the area and the hole is not associated with a surface canal.

#### **6.5 Chapter Summary**

Afghanistan has a long history of human groups moving throughout the country. There is evidence of groups as early as the Paleolithic in the north at rockshelters and cave sites, while in the southeast, in Ghazni<sup>98</sup> (Davis and Dupree 1977: 142, 145) lithic scatters were discovered on the beaches of ancient lakes. **MUNDIGAK** and **DEH MORASI GHUNDAI** are two sites that date during the Chalcolithic (5000 – 2900 BC) in southeastern Afghanistan that represent connections with the Indus Valley. **MUNDIGAK** boasts connections with Iran, Mesopotamia, Turkmenistan, the Oxus and Quetta regions, and the Indus Valley (Ball 2008: 45) and may have been a provincial capital for the Indus Valley Civilization (Dupree 1973: 266). Chalcolithic sites near Afghanistan have circular walled ramparts, possibly for defense (Ball 2008: 45) and this may indicate that some of the circumvallation features I identified in the study area can date to this period. **GARDAN RIG** is a Bronze Age (4000 – 1500 BC) site situated in southwestern Afghanistan, in Afghan Seistan ca. 15 km east of the Iranian border. The site contains evidence of copper smelting and pottery manufacturing. This suggests that the area

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<sup>98</sup> At **GHAZNI PROVINCE SITE NO. 2 (G.P. 2)** and **GHAZNI PROVINCE SITE NO. 4 (G.P. 4)**

was once a major industrial area covering over 200 km<sup>2</sup> (Dales 1972: 19; Fairservis 1961: 69). These early sites dating to the Chalcolithic and Bronze Age illustrate the presence of early groups in southern Afghanistan; the specialization of trades, such as copper smelting and pottery manufacturing; and the establishment of trade and communication networks.

There are 23 modern permanent villages situated within the study area that are discussed in more detail in Chapter Seven. However, there is also evidence in the remote sensing imagery of the remains of nomadic or semi-sedentary groups. These groups continue to exist today; however, their seasonal migrations are affected by the current security climate. The presence of these remains further illustrates the movement of peoples through and within southern Afghanistan.

This chapter demonstrated that remotely sensed data can be used to identify previously undocumented archaeological sites and to map these features. I identified 107 possible archaeological features that are not included in the Archaeological Gazetteer of Afghanistan (Ball 1982). The archaeological data produced in this research has several significant components. First, remotely sensed data (e.g. orthoimagery and LiDAR) has been successfully utilized to identify previously undocumented archaeological features and I compiled an archaeological gazetteer of these features from the Maywand study area (Appendix C). This gazetteer provides an inventory of cultural property in the form of possible archaeological sites and features, including feature type, possible temporal affiliation, and geographical coordinates, that can be utilized in future archaeological research. Ideally, in the future myself or other researchers will use this database to verify whether these remotely identified features

are significant and of archaeological value. Second, an archaeological survey of these features, and the areas between them, may suggest that some of these features are actually part of larger multicomponent sites. Third, this data can assist in the protection of archaeological features during conflict but also during reconstruction. It provides Provisional Reconstruction Teams (PRTs) or national, community, and international planners and organizations in with a map of potential cultural features that should be avoided, if possible, in the planning process.

## **VII. CHAPTER SEVEN: RESULTS OF KAREZ MAPPING AND REMOTE SENSING DATA**

### **7.1 Introduction**

In this chapter, I present the identification and mapping results of karez systems in the Maywand study area using both points and complex lines. I present the results of using the normalized difference vegetation index (NDVI) as a method to determine karez activity, and discuss the current state of karezes in Afghanistan, focusing on modern threats to their existence and the impacts of recent and current activity on the flow of the karezes. Furthermore, in this chapter I make recommendations for karez use based upon observations regarding landscape change and how it affects resident populations.

### **7.2 Karez Identification and Mapping Results**

There are 50 karez systems situated in the study area—25 karezes are active, 19 inactive, and six could not be determined (Figure 44). I mapped them using both points and lines. Figure 45 illustrates the line mapping. I mapped all 50 using polylines<sup>99</sup>—including surface canals and relict portions of karezes where present. The longest karez in the study area is K38 at 3,590 m followed by K258 at 3,523 m and K59 at 3,502 m. The shortest karez is K233 at 59 m while the second two shortest are K234 and K232 at 74 m and 70 m, respectively. Nearly 50% (24) of the karezes in the study area are less than a kilometer in length, ranging from 59 m to 962 m. The remaining 26 karezes range in length from 1007 m to 3590 m (Appendix B).

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<sup>99</sup> A polyline is a more complex form of mapping, as compared to using a point the polyline is a shape made up of one or more paths and the paths consist of multiple segments.

### 7.3 Karez Observations

Karezes change over time due to the collapse of vertical access shafts. This results in modifications that are evident on the landscape. In Baluchistan, Zandrakarez<sup>100</sup> contains 36 shafts, 18 of which are new, and 18 that are old (Mohyuddin, et al. 2012b: 135). Approximately 80 years prior the karez tunnel became blocked and villagers needed to construct a new tunnel that also necessitated the digging of new vertical access shafts. The old shafts and tunnel are not functioning (Mohyuddin, et al. 2012b: 135). Historically, karezes and villages have been abandoned for various reasons. When villages are reoccupied, the karezes are reconstructed (Lightfoot 1996: 326; Lightfoot 2000: 218). These changes are imprinted on the landscape as illustrated with karez K1. This system is active, but there are several older sections that appear to be no longer in use and are categorized as relict portions (Figure 46). It is important to keep in mind that these older relict sections may be remains from a different system and not part of K1. However, determining this would require higher resolution historical imagery and/or on-the-ground fieldwork.

Based on observations using orthorectified imagery (USAGC 2008b), the surface canal of a karez enters the village and supplies residential compounds before supplying agricultural fields. The canal weaves in and out of residential compounds, passing under mud-brick walls and crossing roads (Figure 47). Unfortunately, since the canal splits into various other surface canals and weaves into homes, it often becomes difficult to trace completely from aerial imagery. Small bridges are constructed over the canals in residential areas (Figure 48).

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<sup>100</sup> Zandrakarez is situated in the village of Zandra, in the District of Ziarat, Baluchistan Province, Pakistan (Mohyuddin, et al. 2012b: 131).

## **7.4 Crops and Cropping Calendar**

Crop calendars are important to understanding what crops are grown and are visible in remote sensing imagery on a particular date (Lillesand, et al. 2004: 201). As noted in Chapter Two, the study area is located in “Livelihood Zone 9: Southern Intensive Irrigated Vegetable and Orchard” (FEWS NET 2011: 27). The principal crops harvested in this zone, and throughout Kandahar, are poppies (April-May), wheat (May-July), maize (October-November), barley (April-May), pomegranates (August-October), and grapes and melons (June-September) (Figure 49) (FEWS NET 2011: 27; USAID 2011: 4). Landsat 5 imagery is from spring (June 21, 2010), summer (September 9, 2010), and fall (November 15, 2011). The imagery acquisition dates correlate to the cultivation of wheat and poppies and the harvest of wheat, grapes and melons, and pomegranates.

## **7.5 Results and Discussion: Hypothesis 2a (NDVI and Karez Activity)**

NDVI analysis using Landsat 5 imagery from spring (June 21, 2010), summer (September 9, 2010), and fall (November 15, 2011) indicate that there is a greater presence of positive NDVI values in the spring image (Figure 50), slightly less in the summer (Figure 51), and even fewer during fall (Figure 52). NDVI is an indicator of vegetation vigor. Therefore, positive NDVI values are associated with the presence of green vegetation. The appearance of greater NDVI values in spring as compared to fewer in summer and even fewer in the fall correspond to the harvest times of wheat, grapes, and melons. Although wheat is harvested from May through July, the imagery acquisition date of June 21<sup>st</sup> may be too late to detect peak greenness. Since grapes and melons are harvested later (June through September), the positive NDVI values

may be indicators of these crops. This may be validated by the appearance of slightly fewer occurrences of positive NDVI values seen in the summer (September 9<sup>th</sup>) image. Both melons and grapes can be harvested while the vines and plants are still green. Therefore, these harvested crops would still produce positive NDVI values. NDVI values are much lower in the fall image (November 15<sup>th</sup>) for two reasons: 1) the harvesting of maize and 2) wheat and poppy cultivation. Maize is harvested in Kandahar from October through November. The stalks are not green at the time of harvest, so negative NDVI values would be produced. Wheat and poppies are cultivated from November to January, so we expect the fields to be plowed or in the process of being plowed in mid-November. As a result of preparing fields for cultivation, negative NDVI values would be produced.

I integrated these NDVI results with the karez line mapping data ("KANDAHAR\_KAREZ\_LINES") in ArcGIS and displayed whether the system was an active, inactive, or undetermined karez. Then, I produced three images: spring, summer, and fall respectively (Figures 53-55). In reviewing the distribution of karez in association with the NDVI results, a notable observation is that the karez systems that are clustered to the north and south of the Herat-Kandahar road appear in the orthoimagery as functioning. In reviewing the NDVI results, this area has the greatest frequency of positive NDVI values. These NDVI values are an indicator of vegetation vigor. Based on these positive values, we can conclude that the karez that appear active and which contain positive NDVI values are supplying these fields with irrigation water. It is important to keep in mind that other water sources, such as pumped wells may also be in use.

**Hypothesis 2a** stated that: NDVI can be used to determine whether a karez is active. This hypothesis is supported as illustrated by a number of karezes in the study area.

Analysis indicates that NDVI can be used to determine whether a karez is active or inactive. It is important to remember that the orthoimagery dates to 2008 while the Landsat imagery used to generate NDVI dates to 2010 and 2011. This means that while a system may appear to be flowing based on the condition of the vertical access shafts seen in the 2008 orthoimagery, the NDVI calculated on later imagery may indicate that the karez is now inactive. Therefore, it may be possible to use NDVI as an indicator of karez death and/or abandonment. There are two additional important things to consider, however: 1) it is unknown how long a karez will continue to flow if abandoned and 2) while NDVI may be used as a possible indicator of karez death and/or abandonment, this method needs to be tested on the ground before it could be used with certainty.

Karez identified as being active based on orthoimagery and which are associated with positive NDVI results include: K223, K222, K230, K31, K36, K 38, K62, and K59, just to name a few (refer back to Figure 53). Karez that appear inactive based on the orthoimagery and which are associated with negative NDVI values include: K266, K265, K264, K41, K228, K6, and K267, just to name a few. K264 is a relict karez and may be an older, abandoned branch of K223, which is active. The same may also be true for K6, a relict karez, which may be part of the active K224. K221 and K259 are examples of karez systems that appear inactive based on the orthoimagery but which are

associated with positive NDVI values. This may be a result of incorrect categorization based on the orthoimagery data, or it may be that water is being provided for these fields from another source, such as another karez or a well. After a closer examination of K231, which provides for the village of Village 4 (refer back to Figure 54), it is clear that another karez (K62) also leads to the Village 4 fields. Karez identified as “undetermined,” K154 and K155, do not lead to fields with positive NDVI values.

## **7.6 Historic Remote Sensing Data: Corona Imagery**

Karez data were overlaid on Corona imagery (USEROS 1980). The visibility of karez identified and mapped using the orthoimagery (USAGC 2008b) varies in the Corona imagery based on whether the karez is active vs. inactive. Figure 56 illustrates the difference in resolution of the Corona imagery (USEROS 1980) (top) and the orthoimagery (USAGC 2008b) (bottom). Those identified as active appear clearly on the landscape in the Corona imagery, whereas inactive karez are harder to detect on the Corona scene. This may be a combination of the lower spatial resolution and the fact that inactive karez do not leave crisp signatures on the landscape that can be detected easily. While active karez are visible in the Corona image, inverting the color ramp makes the active karez and their surface canals visually “pop” by making them brighter than the surrounding landscape (Figure 57).

A comparison of the Corona (USEROS 1980) and orthorectified imagery (USAGC 2008b) illustrates that the active karez visible in 2008 also appear on the landscape in 1980. However, some karez categorized as having “undetermined” status in the 2008 imagery, such as K258, are not visible in the 1980 imagery. However, others such as K197 are visible. As noted above, it is unknown how long an abandoned

karez will continue to provide water or how long an abandoned karez will appear in remotely sensed imagery as though it were still active. Based on the available data produced from the observations of active karez in the Corona imagery and the later orthoimagery, karez are not being abandoned in the study area; nor, in this span of time (1980-2008), has there been a notable construction of new systems.

## **7.7 Effects of Karez Loss**

The loss of a karez is not just a local issue that affects an individual village. There are multiple layers of effects in the loss of karezes. These include: creating distance between intervening actors and local communities, the loss of a labor source and indigenous knowledge, and the loss of active cultural property that is an environmentally appropriate source of water. As noted in Chapter Two, the modification or alteration of karezes by military forces creates tension or conflict and can result in distance between intervening actors, such as the military or NGOs, and the local communities (Fipps 2006; Kelso 2001; Phillips 2009). These cases illustrate that preventing the maintenance of karezes could foster feelings of distrust between local villages and military officials, especially regarding military activities in their areas. Poor communication will lead to the military forces being unsuccessful in implementing projects or risking their projects being sabotaged by the local communities. This, in turn, could lead to a loss of materials, and goods and/or services that have a humanitarian objective. Furthermore, if the local communities do not trust military officials they may side with the insurgency and could potentially bring harm to the base or those associated with it.

When karezes can no longer provide sufficient water for the community and agricultural activities, individuals seek employment outside of the community. In so doing, they alter social relationships and the karez is no longer “the tie that binds.” While there is often conflict within the village regarding the karez, water rights, and timeshares, the karez makes people work together, reducing the notion of the individual and individual needs. The karez creates bonds both within and outside of the community (Kakar 2011: 11-13). When a karez dies, the bonds with neighboring villages and semi-sedentary people who rely on the villages for water and supplies changes. With massive loss or abandonment of karez systems, there is a loss of intangible culture, such as indigenous knowledge on how to construct these features and oral histories and memories on their use and construction. Karez are environmentally appropriate for rural villages in southern Afghanistan, and their loss does not signify a simple change in technology, but also one in likelihood of survival.

Karezes are labor intensive and expensive to construct. But, once karezes are constructed they are relatively affordable to maintain in comparison to mechanized pumps that use diesel fuel and the mechanical parts necessary for pump maintenance. Furthermore, the maintenance fees or in-kind labor for karezes are dispersed to respective users within the community (Kakar 2011). When the U.S. military offered to dig wells and install pumps for the villagers affected, the villagers declined the offer. Fipps (2006: 1) notes they stated “they are only subsistent farmers and have no income with which to purchase fuel for the diesel pumps and pay for maintenance. Hand pumps are not an option since they produce insufficient volumes of water for irrigation.” This

statement illustrates the importance of the karez and affordable means of irrigation water for local communities.

## **7.8 Recommendations**

The economic and political situation in Afghanistan is challenging to navigate. Recent publications cover a broad range of topics in Afghanistan. These include Afghanistan's archaeology, architecture, and cultural property (Hiebert, et al. 2008; Knobloch 2002; Morgan 2012; Samizay 2003; van Krieken-Pieters 2006b), and history (Barfield 2010; Goodson 2001; Isby 2010; Jones 2009; Tanner 2002), to name a few; but publications also focus on intervention (Hussain, et al. 2008; Stewart and Knaus 2012) and assessing progress (Chandrasekaran 2012; Evans and Osmani 2005). In reviewing the literature focusing on intervention and progress, it is evident that the current situation in Afghanistan has multiple layers, each with various players contributing at international, national, and local levels. Each player has their own agenda and objective, and both restrictions and limitations (i.e., legislation, travel restrictions, etc).

This section will present recommendations on karez use and revitalization based on the data currently available. My recommendations will take an anthropological perspective. My intent is that these recommendations will be taken into consideration by government and planning officials, as well as international aid organizations when development plans are being drafted and implemented.

While recommendations may seem straightforward, they need to be based on community needs and in accordance to cultural practices. However, there are factors that may prohibit recommendations from implementation because they may not be in

accordance to the goals and objectives of intervening agencies. For instance, Chandrasekaran (2012: 200) notes that cotton is the second most lucrative crop in Afghanistan—poppy is the most lucrative. Land planted with poppies increased by 20% since 2011, with the high price of opium cited as the propelling factor (Graham-Harrison 2012). However, cotton was not promoted for a number of reasons. First, multiple accounting errors caused the cotton gin to appear as though it was functioning at a financial loss (Chandrasekaran 2012: 201). Second, USAID presented multiple arguments that cotton required too much water to grow, that Afghan cotton was inferior to other cotton grown in the region, and that it required government subsidies (Chandrasekaran 2012: 201-202). Third, the Bumpers Amendment prevented U.S. funds from assisting foreign cotton producers, (Chandrasekaran 2012: 202). The Bumpers Amendment prevents foreign assistance for agricultural development so that the recipient country cannot compete with U.S. farmers (Veillette 2011).

In the archaeological community, “context” and understanding the context is essential for the interpretation of material cultural. This is especially true for understanding how villages and their social dynamics in Afghanistan. A report dated from 2010, titled “Understanding and addressing context in rural Afghanistan: How villages differ and why” (Pain and Kantor 2010) should be required reading for all agencies intervening in Afghanistan. This research would have served the development community had it been produced earlier when the humanitarian efforts were just starting. It illustrates the differences of villages in various provinces of the country and discusses how social structures vary within them. It is important for intervening actors to understand the demographics of the province, district, and village in which they are

working. By understanding the demographics, gender roles, the history of social relations within the villages, and the evolution of those relations will assist intervening agencies in planning and implementing successful projects and programs aimed at improving the quality of lives of local communities. Without this knowledge, projects will have limited success. Indicators that ask the right questions, need to be developed to determine whether projects are successful or not and why. Furthermore, in addition follow up research is needed to determine the outcomes of projects or the impacts they have had on local communities. Pain and Kantor (2010:2) state “measures that focus on delivery activities or outputs based on simple indicators that can be easily counted are often used to claim program success. Less attention is paid to outcomes or impact.” Understanding what factors condition outcomes or impacts at local, national and international levels are important to program success.

Karez have existed in the region for millennia. This anecdotal research alone indicates that the wide-scale use of wells with mechanized water pumps, especially in the rural areas of Afghanistan, over time will have a detrimental effect on the local communities. In turn this will also affect Afghanistan on national and international levels. War, extended drought, and water and food scarcity has affected the livelihoods of Afghans and as a result individuals have turned to other options to earn livings, such as poppy cultivation farming, and these activities facilitate the insurgency and contribute to the insurgency of Afghanistan.

## **7.9 Chapter Summary**

This chapter demonstrated the use of orthorectified aerial photography to map karez systems using both points and lines. The line mapping is a more complex form of

mapping that uses multiple segments to illustrate the location of each system on the landscape. Karez mapping has resulted in a catalog of karez within the study area as well as additional data and attributes. I produced NDVI analyses using Landsat 5 imagery for spring, summer, and fall seasons and then karez data were overlaid in GIS to analyze karez activity. NDVI results suggested that this form of analysis could be used to determine whether systems are active or inactive.

From a planning and development perspective, this information can assist reconstruction teams in both new and rehabilitation projects in southern Afghanistan. Karez are appropriate technology in arid environments but they are also affordable to maintain for rural villagers in comparison to wells that use mechanical pumps (Fipps 2006: 1). Understanding why the karez is appropriate for this region could be the difference between a successful project and one that fails. Intervening actors need to take these factors and other contextual information on village structure into consideration when planning and implementing projects. Focusing on the rehabilitation of karez systems in rural communities in southern Afghanistan will assist them in gaining their independence from international aid organizations and NGOs. This is especially important as military forces are withdrawing from Afghanistan and the country is receiving less funding and projects.

From an academic perspective, these data provide information that can be integrated into additional mapping exercises and that can be analyzed from a historical, anthropological, and archaeological context. An inventory of karez, their distributions, and understanding their appearance and movement on the landscape can help argue that these systems are part of the cultural landscape and should be protected and

revitalized—not only for their historical value but because karez are appropriate technology in the region.

## **VIII. CHAPTER EIGHT: CULTURAL LANDSCAPE CHANGE OVER TIME RESULTS**

### **8.1 Introduction**

In this chapter, I present data with which to compare the villages illustrated in Corona (USEROS 1980) imagery with those seen in orthoimagery (USAGC 2008b). I discuss how imagery associated with different seasons could affect the interpretation of cultivated fields. I compare villages seen in the imagery with an emphasis on their expansion between 1980 and 2008. I highlight and discuss village components, such as the karez and agricultural fields. I discuss relationships among qala fortresses and karez using data from case studies. I also discuss and analyze cultural landscape change by testing four of the hypotheses presented in Chapter Two.

### **8.2 Seasonality Considerations**

The issue of seasonality was significant given how agricultural activity varies throughout the year. Consideration of seasons is therefore an essential component of interpretation. The Corona (USEROS 1980) imagery I used to analyze cultural landscape change was obtained in summer (July) while the orthoimagery (USAGC 2008b) was obtained in fall (October), seasons between which agricultural activity varies. Although different crops grow in the summer than in the fall, I determined that these scenes from these two seasons are suitable for analysis based on NDVI analysis (refer to Chapter Seven) that indicated there are more positive NDVI values in the spring imagery, fewer in the summer, and even fewer in the fall. These results indicate that there are fewer fields in active cultivation in the fall than in the summer. Therefore,

as will be discussed below, if there is an increase in cultivated fields from 1980 to 2008, this may be an indication that more fields are being cultivated in 2008 than in 1980. This could result from either the cultivation of more fall and wheat crops, population increase, or the return of refugee populations to their home villages during this period.

### **8.3 Village Observations 1980 Corona and 2008 Orthoimagery**

I realized two additional limitations when working with this data: 1) a lack of spatial resolution of the Corona (USEROS 1980) imagery inhibited land-use mapping (i.e., agricultural, domestic, etc.) that would provide measurable data to compare with the orthoimagery and 2) politically sensitive areas that are present in the orthoimagery prevented display of the full study area. To address this, I present four smaller sections of the study area devoid of specific geographic information such as village names, roads, and coordinates for both sets of imagery. In my analysis, I overlaid settlement data (AIMS) on top of the Corona and orthoimagery and renamed the villages using numerals (i.e., Village 1, Village 2, etc.) because I reference reports produced by scholars (Pain 2010; Pain and Kantor 2010) using letters (i.e., Village A and Village B) and to avoid confusion. I did this to preserve the security of the military bases situated within the study area. By removing the village names and using sections of the study area, it is harder to piece together the Maywand study area and to compare my data with other publicly available data, such as Google Earth in order to triangulate where the sensitive areas are located.

There are 23 villages in the study area. Visual comparison of Corona (USEROS 1980) imagery and orthoimagery (USAGC 2008b) suggest that village expansion has occurred. From 1980 to 2008, it can be seen that villages contain outlying residential

compounds and more fields are in cultivation. The Corona image (bottom) in Figure 58 indicates that Villages 2-4 appear on the landscape as small compact clusters while the orthoimagery (top) shows expansion of both villages and cultivated fields, although there may be fallow fields associated with each of the villages that are not visible in the Corona imagery due to low resolution. Although this has yet to be confirmed, this expansion could be a result of residents returning to their homes and villages following the Soviet War. According to AMS settlement data, Villages 2-4 existed in 1980, as also indicated in the Corona imagery. Village 1 was settled after 1980 since it is not present in the Corona imagery but is visible in the 2008 orthoimagery. Figures 59-61 also illustrate development and expansion in the study area from 1980 to 2008.

English (1966: 50) notes that in Kirman City, Iran, household location and proximity to a karez is determined on the basis of “social and economic status.” Those residents who are closer to the top of the karez watercourse receive cleaner and more plentiful water. This suggests that one would not expect to see expansion to the north of where a village has been already established unless the residence (or residences) are not receiving karez water. However, an expansion occurs north of where the Village 5 was originally established and two residential compounds are visible (refer back to Figure 58). There is one residential compound situated along the karez watercourse and the other residential compound contains agricultural fields, is situated further to the north and sits on the western side of the line of karez access shafts.

### **8.3.a Village Components**

Observations based on orthoimagery indicate that there are several noteworthy components to villages situated within the study area: 1) residential compounds, 2)

actively cultivated fields, 3) fallow fields, 4) cemeteries, 5) the principal karez and its associated surface canal, and 6) possible archaeological features. However, villages vary and contain different combinations of these components (Figure 62). I use the term “residential core” to indicate a cluster of residential compounds and associated fields (i.e., actively cultivated and fallow). Every village in the study area has a residential core. However, other residential compounds may be present at great distances from this core. It is difficult to understand their association to the village with only remotely sensed imagery. Village 4 has a village core and both active and fallow fields (Figure 63 and 64). There may be an outlying residential compound that is associated with this village and it may have its own water source since there is a nearby water retention pond and a structure that could be a covered well associated with it (see Figure 64b). A neighboring village, Village 5, clearly contains a village core, both active and fallow fields, a cemetery, and outlying residential compounds that appear to be associated with additional active and fallow fields. Village 5 is associated with karez K224. This system appears to be active, yet an additional karez K259 appears inactive and runs in close proximity to an outlying residential compound. This raises the question of whether there are additional sources of water, perhaps wells and pumps for outlying residential compounds, that are not visible in the imagery. It is probable that there are because surface canals are absent. Furthermore, what may be tubing leading to a water retention pond suggests that a pump well be an alternative water source (Figure 65).

## **8.5 Discussion: Cultural Landscape Change**

Cultural landscape change in southern Afghanistan is evident in the available literature, however, not as evident in the remotely sensed data. The varying resolutions between the orthoimagery and the historic Corona imagery made measuring these changes for Hypothesis Two difficult. I present and discuss these changes in the hypotheses 2-5.

### **8.5.a Discussion: Hypothesis 2**

**Hypothesis 2: There is a pattern in cultural landscape change over time that demonstrates a decline in karez use.**

Based on the remotely sensed data, this hypothesis is invalid. A comparison of the remote sensing data from 1980 and 2008 shows there has not been an increase in karez construction from 1980 to 2008. As noted above and in Chapter Seven, the lack of a suitable resolution posed a problem with using the Corona imagery to map karezes to compare with those mapped using the 2008 orthoimagery. Instead, I overlaid the 2008 mapped karezes on the Corona imagery. Then, I turned the karez layer on and off to determine whether those mapped using the 2008 data were visible in the 1980 data. All of the karezes that appeared to be active, based on clearly defined open vertical access shafts, were visible in the 1980 imagery. But karezes identified as inactive in the 2008 imagery were difficult to see or were not visible at all in the 1980 imagery. Therefore, it is not evident based on the remotely sensed data that there is a decline in karez use. However, research from case studies does indicate a decline in their use and subsequent changes in the cultural landscape. However, case studies from villages throughout the region and in Afghanistan indicate that when the karez dies, water is obtained from other sources (Lightfoot 2009: 21; Pain 2010: 13). One such

example comes from Dand District in Kandahar Province. Pain (2010: 13) notes that the karez in Village B died and as a result, the land repurposed for brick making. Evidence of inactive karezes are visible on the landscape. However, there is also evidence of other possible sources of water visible in the remotely sensed data. Agricultural fields contain evidence of water retention ponds with tubing and other equipment that may represent the presence of a well and a pump.

### **8.5.b Discussion: Hypothesis 3**

#### **Hypothesis 3: Karez represent cultural property at local, national, and world levels.**

This hypothesis is supported. Karezes represent cultural property at local, national, and world levels. In Afghanistan, karezes are cultural property at local and national levels (Omar Sultan, personal communication). As noted earlier, it is probable that the first systems were introduced to Afghanistan by the Achaemenids (ca. 550-300 BC) and then again during Islamic expansion during the 7<sup>th</sup> and 8<sup>th</sup> centuries. Karez technology has been essential to sedentary life in arid environments and continues to be the life force of many villages today. In an article discussing a karez<sup>101</sup> and its importance, one of the villagers stated, “The village is nothing without our karez” (Phillips 2009). The importance of water is deeply rooted in the Islamic belief systems and water management practices within Islam are supposed to be sustainable (refer back to Chapter Four). Karezes are both sustainable and are appropriate technology for arid environments. Scholars (Boualem and Rabah 2012: 2, 6; Hussain, et al. 2008; Lightfoot 2009: 6; Salih 2006: 86; Wessels 2008: 14) acknowledge the historical

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<sup>101</sup> Location of karez removed.

importance of karez technology and that karezes constitute cultural property. UNESCO supports the preservation and revitalization of these systems or is considering them for inclusion on the World Heritage list in Iraq (Lightfoot 2009: 6; UNESCO 1995-2012, 2010), Iran (Laureano and Yazdi 2012; UNESCO 2007-2013), and China (UNESCO 1992-2013).

Karez systems are part of the cultural landscape. They are “cultural properties” that “represent the ‘combined works of nature and of man’” (UNESCO 2008: 85). Since the technology has enabled settlements in otherwise adverse conditions, these systems illustrate “the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces...” (UNESCO 2008: 85). As a result of this technology, laws and management practices have been created to effectively manage these systems. These laws and practices have contributed to specialist roles, such as the karezkhan and mirab. These individuals acting in these roles are part of the community and they are responsible for the transfer of knowledge on how to construct and maintain these traditional systems (Kakar 2011: 9-10).

In UNESCO terms, the karez is both an evolved cultural landscape and an associative cultural landscape. Karezes are an evolved **cultural landscape**, that is, their construction is a result an “initial social, economic, administrative, and/or religious imperative” introduced by the Achaemenids and Arabs that “has developed its present form by association with and in response to its natural environment” (UNESCO 2008). Furthermore, this type of landscape has continued to “evolve as a living place or the evolutionary process has ceased and the landscape is in remnant form” (UNESCO

2008). This is illustrated in the evidence of both active and relict portions of karez systems. Their modification over time due to the collapsing of vertical access shafts and the digging of new ones, or the abandonment of entire systems contribute to the evolutionary process of the natural, and social landscape.

The karez is also an associative cultural landscape because it is associated with cultural traditions in that the “landscape is the physical place where intangible aspects of cultural heritage are embodied” (UNESCO 2008). The roles of the karezkhan and the mirab are associated with cultural traditions that are intangible, that is, if their knowledge on the construction and maintenance of the karez systems and their associated oral histories are not taught to future generations, this knowledge will be lost (Kakar 2011: 10). As noted above, UNESCO has projects that focus on the importance of the karezes in Iraq, Iran, and China and while karez technology has been utilized throughout the Middle East and Central Asia, these systems should be protected in other countries, such as Afghanistan, because not only could construction and maintenance vary slightly between countries but because the oral histories associated with these systems are unique to the countries they are situated within.

#### **8.5.c Discussion: Hypothesis 4**

##### **Hypothesis 4: The karez can be used to evaluate the presence of social hierarchies and/or heterarchies.**

My evaluation of this hypothesis is inconclusive due to a lack of adequate remotely sensed data. As noted above, the Corona imagery lacked suitable resolution to map karezes and villages in order to obtain measureable data. However, data from research reports indicate that both hierarchies and heterarchies are prevalent in southern Afghanistan (refer to Chapter Four for an in depth discussion on heterarchy).

In order to determine whether karez systems can be used to evaluate the presence of social hierarchies and/or heterarchies, I consulted the remotely sensed data from 2008, and books (Barth 1959; Dupree 1973; English 1966; Wilbur 1962) and reports (Pain 2010; Pain and Kantor 2010) that contained case study data on villages and livelihoods in Kandahar. It is evident that both heterarchies and hierarchies are present in Pashtun society based on the available literature. However, the presence of heterarchies and hierarchies are less evident—but not completely dismissible—based on karezes in the remotely sensed data.

Karez ownership may be private or communal (Kakar 2011; Roe 2008; Rout 2008), but ownership varies from village to village (refer back to Chapter Four). The social conditions in which the karezes are constructed vary. A privately constructed karez by one wealthy individual, as suggested by research in Iran, denotes a hierarchical form of social organization (English 1966: 50; 1968: 179). However, constant maintenance of the karez which necessitates the selling off of shares (English 1968: 179) may suggest a shift in the type of social organization from hierarchical to heterarchical.

Several parallels exist between Medieval Europe and Afghanistan and feudalism has occurred in both. Bloch (1961: 247) describes feudalism as “the vast, hierarchically-organized system of peasant subjection and military vassalage.” Bloch (1961: xvii) notes “... living in an age of absolute monarchy, the most striking characteristic of the Middle Ages was the parceling out of sovereignty among a host of petty princes, or even lords of villages.” However, something quite similar occurs in

Afghanistan during the rule of King Abdur Rahman. Rahman installed loyal followers to the position of provincial governors (Dupree 1973: 420).

Hallet and Samizay (1980: 123) find parallels between the socioeconomic structure of a Pashtun qala in northern Afghanistan and the agricultural feudalism associated with Medieval castles (or manors) in Europe. An analysis of the manor and the qala demonstrate that these two structures were analogous and served essentially the same purpose. The manor was an estate that was “inhabited by the lord’s subjects” (Bloch 1961: 241). They ranged in size but consisted essentially of the goods that were taken directly by the lord, and tenements (or tenures) that were peasant holdings (Bloch 1961: 241). As noted earlier, qalas also range in size and are associated with wealthy landowners (or khan). They house a single extended family, several extended families, or an extended family and its associated non-related agricultural workers (peasants or tenant workers) (Hallet and Samizay 1980: 123, 125, 137). It is unclear whether the socioeconomic structure of Pashtun qalas in southern Afghanistan was similar to that of the qala in the north. But, based on historical migrations, it is probable that this structure was present in the south and then established in the north by Pashtuns.

The Pashtuns have historically been concentrated in the southern part of Afghanistan and in northern Pakistan, but there is evidence of forced migrations. It is possible that the Pashtun qala originated<sup>102</sup> in southern Afghanistan and was brought to the north (in and around Kabul) during the late 1880s and early 1890s. Pashtuns residing in the north may be the descendants of individuals forced to migrate from the south during the reign of Abdur Rahman in the late 1880s and early 1890s (Dupree

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<sup>102</sup> I use this term loosely as there is evidence that the qala was part of the core of a settlement type that may have originated in Iran (refer back to Chapter 6) (de Planhol 1958; English 1966:16).

1973: 419). Wilbur (1962: 19) notes that Rahman's goal of the forced migrations was to break down "the feudal and tribal system" in order to unite everyone under one ruler and one law.

It is difficult to assess to what extent feudalism existed in southern Afghanistan, especially in the Maywand study area. An argument in its favor is that forced migrations from the south to the north that may indicate that the feudalism existed in the south and was reestablished by those being forced to relocate in the north. An argument against it is that there are not a lot of qalas situated within in the study area, but this does not make a strong case for the lack of feudalism in Maywand. The study area is small (19 km by 11 km) and there could be more qalas situated within the entire Maywand District as opposed to the small window of the study area.

It may be possible that in Kandahar Province, both social heterarchy and hierarchy have existed simultaneously in the past. They may continue to exist based on access to resources and relative freedom of social mobility. Two of the relevant concepts are the positions of *malik* and *khan*. A *malik* is a village chief<sup>103</sup> (Farooq Khan 2009: 14; Hallet and Samizay 1980: 127; Pain and Kantor 2010: vii). A *khan* is a wealthy landowner (Hallet and Samizay 1980: 127; Pain and Kantor 2010: vii). Based on data from documentaries focusing on the current war efforts, there is never a single individual that makes the decisions for the whole village (Hetherington 2010; National Geographic Documentary 2010). Instead, a group of elders participate in a group meeting. However, the terms *malik* and *khan* seem to vary and are used interchangeably. Lee (2006: v,16) defines *malik* as "landlord, village or community

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<sup>103</sup> Dupree (1973:151) provides a differing translation for *malik* noting "the large owner normally controls holdings through resident lieutenants often referred to as headmen (*malik*) or overseers (*arbad*; at times refers to actual owners)..."

leader” and “village representative.” It is evident from case studies in Dand District in Kandahar that the malik could be a wealthy landowner with “absolute power” (Pain 2010: 10; Pain and Kantor 2010: 18). Data from focus groups conducted by Pain and Kantor further illustrate the complication of the terms malik and khan when they note,

in other villages it is the malik system but in our village [the main landowner] is the landlord and head of shura. There is another village ... and they have also a powerful head of village. He also solves the problems of people and is very powerful in the village. But [he] is not the only landowner in [the other village] like [our landowner].

The responsibilities of the malik may also vary based on region or village. In Loralai District, Balochistan Province in Pakistan, case study data notes that the malik is the head of the village and they are in charge of water distribution and management (Farooq Khan 2009: 14). Pain (2010: 6) notes that prior to 1978 the positions of maliks and khans were described in two ways. In the first, Pain (2010: 6), citing Barth (1959), notes “tribal structures were seen as egalitarian and traditional leaders were held accountable through [tribal councils].” This may indicate that there is heterarchy among individuals in the village but that the council represents a hierarchy. It is also quite possible that among the elders in the council everyone is equal which would represent a heterarchy. I base this determination on Crumley’s (1995b: 4) assertion that “heterarchical relationships among elements at one spatial scale or in one dimension (members of the same club) may be hierarchical at another (the privilege of seniority in decision making).”

The second description of maliks and khans focused on a “hierarchical social

structure with strong patron-client relations, characteristic of the Durranis living close to cities linked to the monarchy.” Powerful landlords had control and created “semi-feudal relations” (Pain 2010: 6). However, the Soviet War caused families to relocate, primarily to Pakistan. The experiences of refugees varied. Some refugees drew an income from their land as absentee landlords,<sup>104</sup> some created new opportunities, and others experienced hardships (Pain 2010: 7). After the Soviet withdrawal, “new strongmen” not associated with the “traditional khan elite” were able to return and gain control of their tribes<sup>105</sup> (Giustozzi and Ullah 2007: 171; Pain 2010: 7). This may indicate a shift in socio-political organization suggestive of feudalism resulting from continued invasions and occupations. I will discuss this process further below.

These historical (Dupree 1973: 419; Wilbur 1962: 19) and recent data (Giustozzi and Ullah 2007: 171; Pain 2010: 6-7) on the social organization of the past may illustrate that both social heterarchy and hierarchy can be present at the same time among units pertaining to the same ethnic group, the differences being the result of variation in access to resources and mobility. Access and mobility could be seen in the northern part of the country, to which Pashtun groups were forcibly relocated. Those who could rebuild and have social, financial, and direct access to the produce from their land were able to sustain a hierarchical, feudal-like social structure similar to what may have existed in the south. However, in poorer rural areas such as Maywand, where there may not have been a wealthy malik or khan, the villages may have been more heterarchical and egalitarian.

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<sup>104</sup> Pain (2010:7) does not indicate whether these “landlords” were maliks or khans.

<sup>105</sup> Giustozzi and Ullah (2007:171) do not specify whether the “absentee landlords” that migrated out of Afghanistan were associated with the “traditional khan elite”; however, I expect these absentee landlords were the traditional khan elite.

Household locations in relationship to the karez watercourse may provide some insight into issues of socioeconomic structure. English (1966: 56) notes that in the settlements of Kirman City, Iran, there are few structures associated with specialized activities because the “feudal overlord system drains economic surpluses.” He (1966: 50) also notes that the settlement distribution is linear along the karez course and that “a social gradient exists.” Wealthier individuals, such as prosperous landlords, merchants, and religious leaders, reside in the area closest to where the karez exits into a surface canal while those that are poorer live along the lower portion of the system. Kirman City has a long history of being conquered and is organized under a feudal system (English 1966).

Multiple conquests and extended periods of occupation may facilitate a change in a country’s political and economic structure that, in turn, facilitates a feudalistic type of structure. This may explain why feudalism existed in the late 1800s and why feudal characteristics are present today. Using Medieval Europe and premodern Japan as examples, Trigger (2003: 15) notes that “feudal orders ... evolved out of the collapse of more centralized forms of government and coexisted symbiotically with international religions of foreign origin that strongly assisted their political functioning.” There is evidence of these types of influences (e.g. political and religious) in the archaeological record in Afghanistan (e.g. Buddhism, Hinduism, Hellenistic, etc) (Allchin and Hammond 1978; Ball 2008; Dupree 1973; Knobloch 2002). Historically, periods of centralization have waxed and waned in Afghanistan. Different groups of peoples with varying political goals and religious ideologies have conquered and occupied different parts of the country. These conquests and occupations have affected the local populations, their

settlements, irrigation systems, and cultivated lands as well as contributing to the rich material culture of Afghanistan.

Bloch (1961) also provides insight into the effects that continuous invasions and how power can be “taken.” Without the geographical descriptions, Bloch could be describing Afghanistan when he is discussing the West. He (1961: 39) states, “The towns themselves had not been spared—at least not by the Scandinavians—and if many of them, after pillage or evacuation, rose again from their ruins, this break in the regular course of their life left them for long years enfeebled.” Also, he (1961: 39) states, “above all, the cultivated land suffered disastrously, often being reduced to desert.” Bloch (1961: 39) notes how a shift in power can occur when in discussing the Touloun region, “... the land had to be cleared anew, because the former boundaries of the properties had ceased to be recognizable, so that each man—in the words of one charter—‘took possession of the lands according to his power.’” In Dand District in Kandahar Province, wealthier individuals have been able to purchase large amounts of land or acquire more land (Pain 2010; Pain and Kantor 2010). This has lead, and contributes, to social hierarchy and feudal conditions in some villages. I will discuss these villages in detail below.

Based on data provided by English (1966: 50) on the karez in Kirman City, Iran, and their linear structure, I have been working with the premise that linear structure may represent a hierarchical form of social organization whereas clustered village patterns may represent a heterarchical one. Based on analysis from the remotely sensed data, in Maywand District, household compounds are clustered at the top of the karez system. However, data provided by Dupree (1973: 132) suggests that the clustered (or

nuclear) settlement pattern is common to Afghanistan. He (1973: 132) notes that there are two types of sedentary village settlement-patterns, linear and nuclear, and that the linear type is found in southeast Asia while the nuclear type is prevalent in Afghanistan. This however may be a difference in the interpretation of village settlement patterns versus the settlement patterns of household compounds within the village. Dupree (1973: 132) notes the linear type “occurs along major rivers, clinging to the watercourses” whereas the nuclear type is typified when “villages cluster about a town, and several village-town clusters surround a city.” Dupree (1973: 132) states “villages usually grew in response to needs for water and defense.”<sup>106</sup>

Comparative research from within the Dand District, an unofficial subdistrict situated south of Kandahar City within the official Kandahar District, identifies the presence of social hierarchies within two villages (Pain 2010: 9; Pain and Kantor 2010: 17). In comparison to other districts in Kandahar, Dand District is considered agriculturally poorer due to a lack of “assured irrigation” and fruit orchards (Pain 2010: 10). The two villages studied, Village A and Village B,<sup>107</sup> are both described as having social hierarchies. Pain and Kantor (2010: 18) note five features of hierarchy that are present in these villages:

- “a very small elite owning most of the land”
- “a grain surplus”
- “heavy diversification into non-farm income sources”
- “employment through political connections”
- “the display of self-interest”

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<sup>106</sup> With this discussion of settlement patterns he does, however, provide a little data on specialists, noting that the Andar Pashtun are experts in constructing and repairing karez while the Wardak Pashtun, in the eastern part of the country, construct qalas.

<sup>107</sup> To protect the identity of people in these villages, the authors do not provide the actual names of the villages and instead provide the rough location of “10 to 15 km south of Kandahar” (Pain 2010).

In both of these villages, the land is owned either by a single wealthy malik, or a small group of maliks. In one village, it is noted that the village leader holds “absolute power” (Pain 2010: 10; Pain and Kantor 2010: 18)

Based on descriptions provided by Bloch, feudal characteristics exist in Villages A and B. However, while there is evidence for social hierarchy within these villages, their situations may be unique because based on data from focus groups conducted by Pain and Kantor (2010: 10; 2010: 18), it is uncommon for all of the land to be owned by a very small group of people. In both villages, Pain (2010: 10) notes that wealthier landowners were able to purchase or acquire additional land and access to prominent people within the district and in Kabul facilitate the landowners in gaining power. I will discuss both villages focusing on the condition that promote hierarchy and feudal conditions.

Village A is divided in two halves; data gathered during focus groups note there are three families that control the land. The malik in “absolute control” owns 500 jeribs, or 100 hectares, of land<sup>108</sup> purchased from Hindus in the 1990s (Pain 2010: 10). Pain (2010:13) also notes that Hindus owned the land associated with Village B but ownership shifted and came under the control of “key landlords” during the Mujahideen period when the Hindus left. He (2010: 13) notes that “these lands were taken and the deeds of transfer and land ownership forged.” Scholars do not note the ethnic background of the individuals that were able to take over the lands and forge documents. As a result of these actions, it is possible that these individuals are introducing different cultural traditions and changing the social and political nature of the

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<sup>108</sup> Pain (2010:13) does not provide data on what the other landowners in the other half of the village own.

villages. Hierarchy and absolute control is exhibited in three examples. First, there is the existence of a *shufa* system that states that landowners could not sell their land without having the permission of the adjacent landowner (Pain 2010:vi, 10). A display of power that could lead to a hierarchical form of social organization is possible if a landowner that has power does not permit his neighbors to sell their land.

Circumstances (e.g. debts, poverty, financial stress due to war time, etc.) could arrive that would make the landowner that wants to sell in debt to the other one. Second, sharecroppers cultivate all the land. They live in houses owned by the malik or built on his land. Third, he has *wasita*—a connection to someone in power or that has influence—with individuals both in the Provincial Council and in Kabul and he is head of the National Solidarity Programme (NSP) council<sup>109</sup> (Pain 2010: vi, 10; Pain and Kantor 2010: 18-19). Pain and Kantor (Pain 2010: 10; Pain and Kantor 2010: 18) provides this description for Village A that was obtained during a focus group in 2009:

In the villages of Dand, you will not find such a village where the whole land belongs to three families...in other villages it is the malik system but in our village [the main landowner] is the landlord and head of shura. There is another village...and they have also a powerful head of village. He also solves the problem of people and is very powerful in the village. But [he] is not the only landowner in [the other village] like [our landowner]

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<sup>109</sup> His position of head of the NSP council appears to be disputed according to MRRD but the villagers acknowledge his position (Pain 2010:10-11).

In Village B,<sup>110</sup> the karez has dried up and the land has been repurposed for brick making (Pain 2010: 13). Both villages are located in close proximity to the provincial center of Kandahar and, as such, their residents have easier access not only to markets but to prominent individuals in the provincial center (Pain and Kantor 2010: 17). This means that there could be different village structures situated in close proximity to the Kandahar provincial center in comparison to those villages situated in the Maywand study area. Based on these data from Villages A and B, I expect there to be material correlates that are visible in the remotely sensed imagery.

Since Village A is divided in half, I would expect there to be some visual representation of this. One representation would be if the karez surface canal splits in a manner that is not common to the surrounding villages. There may be evidence of surface canals that have been diverted to provide the main landlord preferential use of water. However, data are lacking on whether Village A is associated with a karez. Pain (2010: 13) notes that Village B is associated with a canal and that it used to have a karez. He (2010: 13) notes that the karez dried up and that the land where the karez had been situated had been repurposed for brick making. Based on this data, it may be possible to identify the repurposed land or possibly evidence of the karez in conjunction with the repurposed land.

Using data presented for Village A and Village B, I expected to be able to use the descriptions to review the orthoimagery for both the Maywand study area and the Kandahar district. The goal was to determine whether settlement patterns and socioeconomic structures associated with them were similar and whether it was

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<sup>110</sup> Pain (2010:4) does not state whether karez are used in Village A, he simply notes “1,500 jeribs of irrigated land and 2,000 jeribs of rainfed land”.

possible to use these descriptions to identify villages as linear or nucleated/clustered. However, this comparison was difficult for three reasons. First, the exact locations of Village A and Village B (Pain 2010; Pain and Kantor 2010) are not provided. Second, the use of karezes in the Maywand study area is significantly different from that of either Village B or Kandahar. Third, the proximity of Villages A and B to Kandahar City introduces variables that are not present in Maywand. As a result, comparing Villages A and B to the Maywand study area could be like comparing apples to oranges. Karezes are prevalent in the Maywand study area while extensive surface canal systems are prevalent south of Kandahar City. Furthermore, as Pain (2010: 13) noted, in Village B the karez had dried up and the land was being used for another purpose.

Given the apples-to-oranges comparison between the study area and Kandahar District, I nonetheless reviewed the remotely sensed imagery in an attempt to identify the villages that conformed to the published descriptions. Given that Village A and Village B are situated approximately 10 and 15 km south of Kandahar City, respectively, using ArcGIS I chose the arbitrary point of the Kandahar-Herat road and measured southward 10 km (Pain 2010; Pain and Kantor 2010). I discovered that the scene was not included in the orthoimagery data for Kandahar Province. Repeating this methodology using Google Earth illustrated that there were extensive canal systems diverting river water (not karez) present in the area where the villages should be according to the descriptions provided by scholars (Pain 2010; Pain and Kantor 2010). I returned to the orthoimagery to review the surrounding landscape for the scene adjacent to the missing one; however, I could not find an example of a karez system that would suggest a hierarchical form of social organization rather than a heterarchical

one.

#### **8.5.d Discussion: Hypothesis 5**

##### **Hypothesis 5: Cultural landscape change is reflected in changing patterns of karez use by associated communities.**

As noted above, based on the remotely sensed data and comparison between the 1980 historic imagery (USEROS 1980) and the 2008 orthoimagery (USAGC 2008b), this hypothesis is not valid. However, based on research reports, this hypothesis is valid. When the karez cannot provide water, the villagers need to seek additional water sources and they do based on data (Pain 2010; Pain and Kantor 2010) from Village B in Dand District in Kandahar Province. Cultural landscape change is evident in Village B because scholars (Pain and Kantor 2010: 13) note that the karez has dried up and the land has been repurposed for brick making. Also, bore wells replaced this karez. Since scholars do not provide specific geographical data for Villages A and B, I have not been able to locate them in the imagery to determine whether cultural landscape changes are visible between the 1980 imagery and the 2008 imagery. What we do see, especially in comparing the 1980 imagery to the 2008 data, is that at the center of the study area, this space has been developed. There is an increase in households and cultivated land from 1980 to 2008, yet there does not appear to be an increase in karez construction (Figure 66).

#### **8.6 Chapter Summary**

In this chapter, I presented village observations using the 1980 and 2008 remote sensing imagery and presented village components. I discussed the results of the remaining four hypotheses, since I already discussed one hypothesis in Chapter Six.

There does not appear to be a relationship between the qala and the karez based on above ground observations of the surface canals of karezes. Instead, these structures receive their domestic water from wells situated within the qala walls or right outside of the qala's entrance—this is supported by remote sensing and literary sources (English 1966; Szabo and Barfield 1991).

There is no remote sensing evidence that there is a decline in karez use from 1980 to 2008, although case study data (Pain 2010; Pain and Kantor 2010) from Dand District in Kandahar suggest other sources of water exists. Additionally, some agricultural fields contain objects that could be water pumps.

Karezes are cultural property at local, national and world levels (Boualem and Rabah 2012; Hussain, et al. 2008; Lightfoot 2009; Salih 2006). Some countries such as Iraq, Iran, and China have projects focusing on the documentation, revitalization, and preservation of these systems. While UNESCO has a project to revitalize karezes in Iraq, there does not appear to be a similar project for karezes in Afghanistan. The use of karezes to evaluate social heterarchies and heterarchies is inconclusive based on the remote sensing data; however, data from case studies (Pain 2010; Pain and Kantor 2010) and other scholars (Bosworth 1998; Dupree 1973; Szabo and Barfield 1991) suggest that both heterarchies and hierarchies can and presently exist in Afghanistan.

Based on remote sensing data there is no evidence of changing pattern of karez use by community in Maywand District; however, case studies (Pain 2010; Pain and Kantor 2010) from Dand District suggest a shift from karezes to wells. Chapter Nine will use remote sensing results and observations to discuss the theoretical interpretations of this research from a landscape archaeology perspective.

## **IX. CHAPTER NINE: INTERPRETATIONS AND CONCLUSION**

### **9.1 Introduction**

In this chapter, I will apply examples of current theory in landscape archaeology, a specific paradigm that informs my investigation. This theoretical framework was selected for this research because I focus on remote sensing methodologies and landscape archaeology is readily applicable to UNESCO's concept of cultural landscapes. I address remote sensing and landscape change over time using data that have been created during the course of this research. I provide a model for the protection of cultural property during conflict and highlight and discuss methods that have proven successful during the Iraq and Afghanistan wars. This model includes the creation of "no-strike" lists, the removal and safe-keeping of moveable cultural property, the identification of previously undocumented archaeological features, and the importance of educating planners and military officials. I discuss the broader implications of this research and the ethical dilemmas presented at the start and during the course of conducting this research. I conclude with a discussion of possible avenues with which to continue or elaborate upon this research and the venues in which I think this research should be disseminated.

### **9.2 Landscape Archaeology**

In order to illustrate the application of concepts from landscape archaeology, I will present three examples of the southern Afghanistan landscape as a palimpsest: 1) one characterized by nomadic or semi-nomadic use of temporary encampments followed by more sedentary use; 2) one characterized by the reuse of existing

structures, such as qalas, for agricultural purposes; and 3) one characterized by the construction, reuse, and modification over time of villages and karezes. I will also discuss three types of landscapes present within the study area: 1) the landscape of conflict, 2) the Pashtun landscape of social order and identity, and 3) the changing landscape identified as such based on a rapid rate of change due to frequency of invasions. I discuss my use of three landscape concepts in order to understand the cultural context of karez use in southern Afghanistan: 1) ethnoscape, 2) taskscape, and 3) archaeoscape. I do not discuss the Afghan landscape as a heritage-scape. As noted earlier, Di Giovine (2009: 6) employs this last term to discuss “UNESCO’s newly ordered social structure.” It is a theoretical model in which “a real social structure which creates real material effects on a globally distributed population in accordance with UNESCO’s long term goals” is asserted (Di Giovine 2009: 6). However, I have not found this term to be useful in the evaluation of landscape archaeology and cultural landscapes. To date, only two archaeological sites have been listed in this category on UNESCO’s World Heritage List. These include: 1) the Cultural Landscape and Archaeological Remains of the Bamiyan Valley and 2) the Minaret and Archaeological Remains of Jam (UNESCO 1993-2012a, b).

### **9.2.a The Landscape as a Palimpsest**

Afghanistan bears the scars of multiple invasions and occupations that have resulted in destruction and abandonment as well as rebuilding and reoccupation of villages. This is evident not only in historical accounts but also in the archaeological record on the basis of my interpretations of new features not previously recorded in the Maywand study area. Bender (2002: S108) notes the use of “palimpsest” or “history” to

describe how local people in southwestern England probably saw “stone row, medieval field systems, 17<sup>th</sup>-century granite working, and 19<sup>th</sup>-century peatcutting.” Here, I use the concept of the landscape as palimpsest as just that—the layering of material culture from prehistoric, historic, and contemporary uses on the landscape. The Afghan landscape is a palimpsest recording invasions and occupations that is still undergoing change.

A landscape becomes a palimpsest in part through superimposition of remains of some activities on top of others, including both natural phenomena (e.g. processes of deposition and erosion) and cultural activities. For example, Feature 36 represents the remains of low walls from nomadic or semi-sedentary camps, the seasonal migration of groups of unknown age (Figure 67). Feature 36a is a unique structure that appears to be situated in close proximity to these remains. It is not clear whether Feature 36 predates Feature 36a for two reasons: 1) it is not clear whether Feature 36a is superimposed on the low walls, something that would allow us to make guesses at its relative age, and 2) nomadic or semi-sedentary groups exist today, so dating based solely on these data is not possible. The multiplicity of features such as Feature 36 creates a landscape of similar superimpositions, contributing to making the landscape itself a palimpsest.

One of the factors that contributes to the landscape becoming a palimpsest is the reuse of existing structures. This includes the placement of fields within the walls of a ruined qala (Feature 24) and the placement of a cemetery on top of a mound (Feature 73). Feature 24 is a ruined and deteriorating qala of which only the outside walls remain (Figure 68). It is no longer used for its intended purpose (a residence) and

instead the inside of the structure is being used for agricultural purposes. Feature 63 is a mound—probably representing earlier construction—that has been converted into a cemetery (Feature 73) (Figure 69). As noted in the archaeological gazetteer (Appendix C) the mound may date as early as Neolithic and the graves may date as early as the Medieval Islamic Period. There is evidence for continuous reuse in the recent past because some of the graves appear covered by sediment or are completely buried.

The landscape as a palimpsest is also seen in the ongoing construction, reuse, and modification over time of villages and karezes. Some karezes in the study area show evidence of older relict portions (Figure 70). Karez are in close proximity to cultural property, especially historic qalas that are no longer used as household compounds and show signs of disrepair and collapsed roofs. However, I have been unable to establish a clear relationship between the karez and the qala. Data within the study area (remote sensing and research reports) and the region suggest that qalas used wells versus karezes for water used for domestic purposes such as drinking and bathing. Dependency on karez for water for domestic use would compromise the security of those living in the qala during times of insecurity. Since the karez taps into an aquifer that is situated upslope from the fields and houses it supplies, the water could be poisoned at any point along the karez system.

### **9.2.b Landscape Archaeology**

The following four themes relevant to the archaeological study of ideational, conceptual, and constructed landscapes are: 1) landscape as memory, 2) landscape as identity, 3) landscape as social order, and 4) landscape as transformation (Barnes 1999; Brady and Ashmore 1999; Kealhofer 1999; Knapp and Ashmore 1999: 13;

Richard 1999). These are manifest in qualities of a landscape that retains memories of conflict, the effects of Pashtun social order and identity, and evidence of continual change.

### **9.2.b.1 A Landscape of Conflict**

The Afghan landscape is a landscape of conflict and has been for the last thirty years. It can also be conceived in terms of different ethnoscapes (Appadurai 1996). I will discuss two of these as they are relevant to this research: 1) the Afghan ethnoscape and 2) the Pashtun ethnoscape. The actors in these ethnoscapes include Soviet military forces, the Taliban, and current military forces, to name a few, although international aid organizations and NGOs do play an important role in the creation of an ethnoscape.

Other actors include the Achaemenids and the Arabs, who in different historical episodes brought karez technology to Afghanistan. The presence of military officials and military installations contributes to the Afghan ethnoscape. This presence, their military activities, and their offer to provide different technology to supply the villagers with water in turn can affect, and does affect, the local and national politics.

Additionally, a change in technology to pump wells that use diesel fuel could make the local communities dependent on international assistance, further contributing to an ethnoscape. The karez is part of a landscape of conflict but is also a manifestation of technology introduced by past occupations of the Achmaenids and Arabs. These actors and the technology they brought with them helped create a Pashtun ethnoscape.

The Soviet Invasion (1979-1989), the period of Taliban Rule, and the U.S. Invasion (2001-present) have contributed to the construction of both Afghan and Pashtun ethnoscapes and have both destroyed and protected parts of the cultural

landscape. Military installations as structures on the landscape, and the individuals present in and around them, and individuals working within the local communities represent a landscape of conflict. This landscape is part of the recent memory of Afghans. The Soviet Invasion leveled entire villages and destroyed historical districts (Burns 1990; Goodson 2001: 5; Jones 2009; Kaplan 1989; Wahab and Youngerman 2007: 184). However, the Soviet Invasion also contributed to the material culture of the Afghan ethnoscape. Soviet tanks are still present on the landscape (Figure 71) (Stewart 2006: *To A Blind Man's Eye*, para. 33; Wahab and Youngerman 2007: 181) and constitute the remains of material culture—even though it may be a culture of war. There is no doubt that there are both positive and negative connotations associated with the visible remains of Soviet tanks and perspectives would vary person to person and across social and ethnic groups. These remains contribute to the memory of individuals who lived through those events and their descendants.

The destruction of cultural property also demonstrates a landscape of conflict. Local communities and the Taliban are responsible for the loss of cultural property. The looting and selling of cultural property has occurred near the archaeological site of **JAM** (Stewart 2006: *Traces in the Ground*). The Taliban has destroyed cultural property, including the much-publicized destruction of the Bamiyan Buddhas (Bearak 2001; Marlow 2011), and sculptures at the Kabul Museum (Jones 2009: 61). The Bamiyan Buddhas were part of the cultural landscape of the Bamiyan valley and represented the material remains of a past ethnoscape. They are also part of an archaeoscape that includes associated settlements, other structures, and associated archaeological deposits. Today, their niches continue to stand as efforts are made to stabilize the cliffs

from which they were carved (Manhart 2001, 2004, 2006). These empty niches represent a past landscape and cultural ideologies that have contributed to the memory of those living in the valley and those who have visited from afar throughout history (Figure 72). They also represent: 1) a current landscape of conflict and a loss of cultural property and 2) part of an archaeoscape that has been modified by outside actors. As a result of the destruction of the Bamiyan Buddhas, as well as other cultural property, the Taliban have had a political effect on local, national, and international levels. How Afghans decide to proceed with the empty niches, whether they are left empty or with reconstructed Buddhas, contributes to the present and future physical and cultural landscape.

In the Maywand study area, cultural property in the form of archaeological remains also contributes to the memory of residents. These remains include mounds, qalas, structures and cemeteries, just to name a few. They are associated with nearby villages and may be considered village property. Agricultural fields are cultivated around these remains and agricultural activities apparently avoid them (Figure 73). The avoidance of features may indicate the effects of memory and their importance in local ethnic identity. However, the avoidance of these features may not be due to cultural values but rather because the areas in which these remains are found are not agriculturally useful. It is evident in the imagery that agricultural fields sometimes avoid but often encroach upon archaeological remains.

A karez and a village associated with it are also part of an archaeoscape impacted by modern land use practices. These affect water flow, but they are also impacted by destruction and modification. The mujahedeen used karez as strategic

locations to hide during the Soviet invasion and as a result the Soviets destroyed many systems (Grau and Jalali 1998). More recently, the U.S. military has destroyed karezes in their efforts to defeat the Taliban because the tunnels represented areas that could be used as hiding places for insurgents and/or weapons caches (Kelso 2001). Also, inadvertent alteration of karez systems occurred during the expansion of one military installation (Phillips 2009). The alteration of karez systems can not only stop or diminish the flow of water in a karez, but it can also lead to unnecessary tension and conflict between local communities and intervening actors such as military forces or NGOs. Furthermore, not granting villagers the right to clean and maintain a karez that runs under a military installation could also result in unnecessary tension (Fipps 2006). Fipps (2006: 1) notes that officials offered to install pump wells for the villagers, but they declined the offer noting that “they [were] only subsistent farmers and have no income with which to purchase fuel for the diesel pumps and pay for maintenance” and that hand pumps did not provide enough water to irrigate fields. This illustrates that military officials who may not fully understand Afghan culture have different perceptions of how to best serve the local communities.

It is likely that the first karez appears on the landscape in Afghanistan during Achaemenid rule in the 6<sup>th</sup> through 4<sup>th</sup> centuries BC and again as a result of diffusion during Arab expansion in the 7<sup>th</sup> and 8<sup>th</sup> centuries. While the use of pumped wells constitutes a modern influence imposed on the landscape by intervening actors, the karez constitutes a historical influence. These karezes are historical in that the technology dates first to the Achaemenid Period and subsequently to Arab expansion but also because—according to the remote sensing data from the Maywand study

area—new karezes have not been constructed from 1980 to 2008. The karez is therefore a result of migrating groups and individuals who brought the knowledge of this technology with them, thus creating an Afghan ethnoscape and contributing to the current Pashtun ethnoscape.

### **9.2.b.2 The Pashtun Landscape of Social Order and Identity**

The physical landscape and its associated human constructions illustrate Pashtun social order and identity. It is socially constructed and affects the ways cultural relations are ordered. The household compound with its mud-brick walls represents and creates social order while Pashtunwali reinforces it through gendered spaces. Pashtunwali means, “to do Pashtun” or “the way of the Pashtun” (Cathell 2009: 8; Kakar n.d.: 3). This is manifest in the concept of *pardah* that restricts women to the confines of their homes. Within the household compound, there are spaces that are defined specifically by gender. In the Maywand study area, mud-brick walls enclose individual residential compounds and the villages themselves are contained within similar walls (Figure 74). Dupree (1973: 249) notes, “the village builds a ‘mud curtain’ around itself for protection against the outside world.” However, Maletta (2008: 175) takes this metaphor one step further, noting that in rural areas women are not permitted outside of the household compound walls.

Villages and their associated property become material representations of the taskscape. Ingold (1993:158) notes “tasks are the constitutive acts of dwelling.” The taskscape refers to “the entire ensemble of tasks” and the relationships among tasks associated with dwellings and other activities (Ingold 1993: 158). The concept of taskscape and Ingold’s (1993, 2000) theory of landscape have been used to study

landscapes in other disciplines, such studies of a therapeutic landscape in public health (Dunkley 2009) and the study of tasks associated with management of an orchard in England (Cloke and Jones 2001). In the Maywand study area, gender roles are among the significant factors that define and limit tasks. Based on case study data in Kandahar, gender roles can define and limit tasks. Both purdah and Pashtunwali reinforce gender roles and condition the taskscape. There are specific tasks that are men's and others that are women's. In the southern part of the country, women's tasks tend to be those carried out within their household compounds. However, due to the ethnoscapes, continued warfare, and changing livelihoods, the taskscape in some parts of the country is changing. For example, in Badakhshan in the north, women work in opium poppy cultivation. In the south, women remain confined to the home and prepare meals for agricultural laborers (Grace 2004: 59). Data from Helmand indicates that women and girls participate in a number of farm-based activities. However, data on women's participation in these activities are lacking for Kandahar (The World Bank 2005a: 55).

The activities associated with karezes represent a taskscape. Based on data gathered from case studies throughout Afghanistan, building the karez and undertaking the agricultural activities associated with them are men's tasks. This includes constructing the karez, managing water allocations, settling disputes, and cultivating agricultural fields (with the exception of opium poppy cultivation as noted above). While in other parts of the country there may be a clear division between women going to get water for domestic use and men using and managing water for irrigation purposes, it is not clear whether this is the case in the Maywand study area. Based on remote sensing

data, the surface canal of a karez weaves its way in and out of household compounds under compound walls. Based on these data, water comes to the household and women may not need to leave their homes to fetch it.

The cultural landscape also acts as stage on which people *engage with the world*, thus creating and sustaining identity. The qala is part of the cultural landscape. It represents identity and sustaining identity through the evolution of its form and function (Figure 75) and the continued use of its architectural style (Figures 76 and 77). Scholars (Hallet and Samizay 1980; Szabo and Barfield 1991) note that the current walled household compound represents the evolution of a qala from its historic fortified form. The contemporary household compound differs from the traditional, historic qala fortress because it lacks the corner guard towers and is constructed on a smaller scale.

### **9.2.b.3 The Changing Landscapes of Afghanistan**

Afghanistan is a country of changing landscapes. Understanding the factors that contribute to landscape change can provide insight into historical and cultural processes and perceptions of them by the actors who contribute—consciously or unconsciously—to landscape change. The reuse of cultural property, such as qala walls used to contain agricultural fields and the placement of cemeteries on mounds, reflects a change from its originally intended use to a modern one. Change is also seen in the change of perception of cultural property. Stewart (2006: A Blind Man’s Eye, para.44) notes, “When he denied the building was a caravansari, I do not think he was being ignorant. He was saying that whatever the building had once been, it was nothing anymore.” The destroyed Bamiyan Buddhas and the deteriorated caravanserais are elements in a changing landscape. The niches are still there but the Buddhas are not and the ruined

caravansari has been reinterpreted. The empty niches are no longer the Buddhist shrine they once were and stand as a reminder of conflict. The altered caravanseri no longer serves its original purpose and its meaning has changed.

The karez is also part of a changing landscape for two reasons: 1) the introduction of this technology initially by Achaemenids and again by Arabs changed use of the landscape and 2) the karez changes over time through collapse of vertical access shafts and excavation of new ones. A karez can be abandoned and then put back into use. The karez of an abandoned village can be revitalized when the village is reoccupied (English 1966: 35; Kakar 2011: 13; Lightfoot 1996: 326; Lightfoot 2000: 218). Evidence of relict vertical access shafts and surface canals appear in conjunction with functioning karezes. Furthermore, actors who make up the changing ethnoscape may influence shifts from karezes to pump wells. This change from one technology to another contributes to a changing landscape. These actors constitute part of the shifting world, thus affecting local politics. Again, as noted above, these technological changes could force local communities to be dependent on international aid.

The Achaemenids (6<sup>th</sup> – 4<sup>th</sup> centuries BC) and Arabs (6<sup>th</sup> – 9<sup>th</sup> centuries AD) transformed the landscape of southern Afghanistan in different episodes, each with introductions of karez technology. Historical data notes the use of various water sources during the Samanid Period (AD 900 – 980), the Ghaznavid Period (AD 997 – 1186), and Timurid Periods (AD 1380 – 1500). These include rivers, springs, wadis and both surface and subsurface canals (Bosworth 1998: 16; Negmatov 1998: 82; Subtelny 2007: 122). The use of technology such as diversion canals, dams, and karezes alters not only the physical landscape but the social landscape as well. Actors within the

ethnoscape require a firm understanding of the environment before offering technologies that can be non-sustainable for both the environment and the local communities. Technological advances contribute to an increase in the number and yields of cultivated fields and population increases as well as social and political changes. This is evidenced by the appearance of despotic conditions that arose during the Ghaznavid Period that “became the norm for many of the pre-modern Islamic dynasties” (Bosworth 1998: 117), during the 1880s and 1890s, and also during the prevalence of these conditions in Afghanistan today.

### **9.3 Remote Sensing and Landscape Change Over Time**

This study suggests a model for identifying landscape change over time using remote sensing. I have identified and mapped 50 karez systems and 107 possible new archaeological features in the Maywand study area. These previously undocumented archaeological features may range in date from the Neolithic Period to the Islamic Period, but some features such as walls that use the architectural style of the qala may be modern constructions. The remote sensing data indicate that: 1) agricultural fields are encroaching on archaeological features, 2) some features have been reused for modern purposes (e.g. mounds for cemeteries, qala walls for cultivated lands), and 3) some features show signs of disturbance that may indicate looting (see Appendix C, Features 13 and Feature 49).

The remotely sensed data do not indicate that there has been either an increase in karez construction or a decrease in karez use. As noted, the Corona (USEROS 1980) imagery lacked adequate resolution to map these features as compared to features mapped with orthoimagery (USAGC 2008b). However, there are a number of

instances in which anomalies appear on the landscape that may suggest the use of pump wells. A comparison of the 1980 to the 2008 imagery indicates development and a possible population increase or a repopulation that occurred in the center of the study area. Karezes do not appear to supply these villages, so it seems likely that people obtain their water from another source, such as wells with pumps.

Using remotely sensed data and the spatial layout of karez systems, I attempted to determine whether the karez and associated features could be used to identify the presence of social heterarchies and hierarchies in the study area. While this was inconclusive, case study data (Pain 2010; Pain and Kantor 2010) notes that two villages in Dand District in Kandahar have a hierarchical form of social organization. We generally expect tribes to be egalitarian in nature and heterarchical; however, Crumley (1995b) notes that both heterarchy and hierarchy can exist simultaneously in the same group. It is probable that, depending upon the conditions in which a karez is constructed, that is, whether by one individual or a community that it will either represent a hierarchical or heterarchical form of social organization. If a karez begins with a hierarchical form of social organization, it may be possible that, as shares are sold in order to maintain the system, the social organization of the village becomes more heterarchical. Comparative data from medieval Europe suggests that extended periods of invasion and occupation promote feudal conditions. The descriptions of villages in the Dand District suggest that feudal conditions are present and that there is a strong hierarchical form of social organization. Historical data shows that characteristics of feudalism begin during the Ghaznavid Period (AD 997 – 1186). By the late 1880s and 1890s, feudalism was still prevalent in southern Afghanistan. It is

unclear to what extent Rahman and subsequent rulers were able to dismantle the feudal system. Because of the last 30 years of continued conflict, the social landscape of southern Afghanistan has changed. It has become one where individuals with financial and social mobility are able to gain control of the land and resources. Because of overwhelming poverty, they are able to subjugate villagers and thus create feudal conditions.

#### **9.4 A Model for the Protection of Cultural Property during Conflict**

The Hague Convention provides provisions for the protection of “cultural property” during times of conflict. The model I am presenting pertains specifically to archaeological remains and complements those provisions put forth by the Hague Convention. Creating a model for all items of cultural property, which includes archives, libraries, and museums as well as archaeological remains, would be time intensive and out of my area of expertise. This model contains four parts: 1) the creation of a “no-strike” list for nonmovable archaeological sites and features, 2) the safeguarding of movable objects, 3) the proactive identification of remaining undocumented archaeological sites, and 4) education about the significance of archaeology as cultural property.

##### **9.4.a The “No-strike” List**

A “no-strike” list is a list of important cultural property locations compiled by regional specialists. This list is used to inform the military of the locations of significant cultural property with the understanding that they are to be avoided during conflict. A “no-strike” list was created before the first Gulf War (Gerstenblith 2006: 280). Another was created before the second Gulf War and, according to Gerstenblith (2006: 286),

was better organized than the first. Estimates indicate that this latter list included at least 5,000 cultural sites (Gerstenblith 2006: 306). In 2005, the U.S. Air Force Combat Command (ACC) received funding through the DoD Legacy Resource Management Program to undertake a feasibility study to create a cultural heritage layer within a GIS that would include information on heritage laws and resources, needed cultural resource data, and to make recommendations for future efforts. The study areas focused on Central America and the Balkans (Green 2010: 112; Van West and Mathers 2007). Since this initial project, various conferences and working groups have been created to protect cultural heritage during conflict and Green (2010) provides an overview of these events. While efforts have been made to protect cultural property during conflict through the creation of “no-strike” lists, it is important to keep in mind that archaeological remains are generally avoided unless it is a military necessity.

Scholars (Boualem and Rabah 2012: 2, 6; Hussain, et al. 2008; Lightfoot 2009: 6; Salih 2006: 86; Wessels 2008: 14) throughout the Middle East and Central Asia note that karez should be considered as cultural property. As such, they should not be damaged during conflict. Furthermore, karezes are part of the cultural landscape and represent intangible cultural property (as discussed in Chapter Eight), are often the only source of water for a village, and could create unnecessary hardships for villagers if destroyed. These could be included on a “no-strike” list. However, because these systems are found throughout the Middle East and Central Asia, the creation of a master list could be used in multiple situations. Until such a list can be developed, the best method for the preservation of these systems is to educate military officials, NGOs, and international aid organizations. This is especially important to do during

reconstruction phases, when traditional systems may continue to be at risk. While there are projects funded through UNESCO to protect and revitalize karezes in Iraq, Iran, and China, there is not yet an equivalent project in Afghanistan. UNESCO should consider more sites. At present, there are only two archaeological sites in Afghanistan on the current Heritage in Danger List even though there are many more sites, including **MES AYNAK** in Logar Province, that should be on either this list or the World Heritage List.

#### **9.4.b Removing, Safe Keeping, and Protecting**

Historically, art and items of cultural property have been removed from museums for safekeeping during times of conflict. This occurred in Afghanistan during the start of the Soviet invasion and in parts of Iraq during the Iraq War (Gerstenblith 2006: 289), although the case of the National Museum of Iraq is a notable exception. During turbulent times, Afghanistan has removed objects from the Kabul Museum. For example, this occurred in 1979 when the building became the Ministry of Defense, in 1989 during a civil war, and in 1996 in anticipation of the arrival of Taliban rule (Grissmann 2006: 61; Grissmann and Hiebert 2008: 45-46, 48). This has proven successful especially in 1989 when trunks of movable artifacts were dispersed between the Central Bank treasury vault in the Presidential Palace—including gold artifacts from Tepe Fullol and the Bactrian gold items—and the Ministry of Information and Culture. Other items remained in various storage facilities of the Kabul Museum (Grissmann and Hiebert 2008: 46). In 2003, the vaults were opened at the Central Bank and the trunks were found to be intact and the remains, including the Bactrian Gold Hoarde, were safe (Grissmann 2006: 70-71; Grissmann and Hiebert 2008: 50-51). Immovable objects, such as statuary, suffer a different fate. During Taliban rule, statuary and other objects

within the Kabul Museum and elsewhere were destroyed because they were considered un-Islamic.

#### **9.4.c Identify New Sites**

Undocumented sites are also at risk, especially of looting. For example, looting of undocumented sites has been an ongoing problem in Iraq and has contributed to the loss of artifacts, sites, and contexts (Gerstenblith 2006: 291; Stone 2008). The looting of known sites in Afghanistan, where looters have plundered both documented and undocumented sites (van Krieken-Pieters 2006a: 231) is also an ongoing problem. **AĪ KHANOUM** and **MIR ZAKAH** are among those looted while others—**TILLYA TEPE**, **DILBERGIN TEPE**, **SURKH KOTAL**, **BAGRAM**, **ROBATAK**, **KHAMEZERGER**, and **KHARWAR**—experienced total destruction (Feroozi 2004: 2).

As my research has demonstrated, remotely sensed data can be used to identify and map previously undocumented archaeological sites. The use of remote sensing data can also be used to protect sites. Archaeologists with remote sensing experience should be hired to review and augment a “no-strike” list. One solution may be to hire a select number of archaeologists to analyze and interpret imagery for cultural property on an as-needed basis based on construction efforts or military activities.

#### **9.4.d Education**

A constant theme throughout my research has been the importance of intervening actors understanding the culture, social organization, and history of Afghanistan in order to design and implement successful projects. Other scholars (Chandrasekaran 2012; Stewart and Knaus 2012: Isolation and Modern Expertise, para. 25) also emphasize why this is important. The recent wars of Iraq and Afghanistan have

illustrated the importance in educating military officials on topics focusing on cultural property. Scholars (Rush 2010b, c; Zeidler and Rush 2010) have written on the recent efforts to create programs and train military officials and planners and about the training materials generated by these efforts. Education about basic archaeological concepts, the types of features and artifacts that are likely to be encountered, and the protection of cultural property during conflict are also important for soldiers, civilian contractors, and others working in zones of conflict.

## **9.5 Broader Implications**

There are four categories of the broader implications of this study: 1) its significance to the field of anthropology, 2) its significance for cooperation between military officials and academics, 3) its significance to understanding and promoting appropriate technology, and 4) its significance for understanding water and food security not only in Afghanistan but other parts of the world.

### **9.5.a Significance to Anthropology**

My research contributes to the fields of anthropology and archaeology in several ways. By documenting the cultural significance and diffusion of karezes in Afghanistan, I have placed the karez in both national and regional contexts. I evaluated these data from a cultural perspective focusing on tribalism and Pashtunwali and demonstrated that while the karez and tribalism represent a heterarchical form of social organization, extended occupation and warfare can precipitate hierarchical and even feudal conditions.

By using remotely sensed data (USAGC 2008a, b) and creating a gazetteer of potential archaeological resources in the Maywand District, I have demonstrated the

utility of this methodology and provided a jumping-off point for future archaeological research in the study area. My Archaeological Gazetteer of Maywand District, Kandahar Province, Afghanistan (Appendix C) presents the data on 107 possible archaeological sites and contributes to the inventory of cultural property for Maywand District. These data can be used to conduct pedestrian surveys in the future and can ultimately contribute to a better understanding of the cultural chronology of southern Afghanistan.

### **9.5.b Necessity for Academic-Military Collaboration**

It is necessary for military officials and academics to work together cooperatively and in complementary ways if cultural property and the livelihoods of people living within landscapes of conflict are to be valued and protected. Academically trained regional specialists are best-qualified to create and provide advice regarding “no-strike” lists used to protect documented cultural property during times of military operations and occupations. Detailed maps are also important in disaster relief because responses to damage inflicted on cultural properties are handled differently than damage inflicted on “vernacular structures,” such as homes or offices (Rush 2013, in press:10-11). Modification of cultural properties—intentional and unintentional—often accompanies activities such as the construction and expansion of military bases overseas. Additionally, cooperation between academics and the military is needed. In the case of Afghanistan, military officials, NGOs, and international aid organizations can better design and implement projects and programs that will benefit the local communities and improve the quality of life of residents if they better understood Pashtun tribal organization, Pashtunwali, and village contexts. As a result of water and food shortages

and political conflict, populations migrate in search of food or labor (Hanasz 2011: 1), migration that in turn contributes to changes in livelihoods and social cohesion in the village or region. Migrating populations also leave large areas or villages to be taken over by others in positions of power, as seen in Villages A and B in Dand District (Pain 2010; Pain and Kantor 2010). IDPs also strain limited resources (Hanasz 2011: 1). Hanasz (2011: 9) notes that water security is linked with food security and therefore affects sociopolitical stability.

### **9.5.c Karezes as Sustainable Resources**

Karez systems are both cultural property and a sustainable, appropriate technology in arid environments. Karez enabled the creation and survival of long-term settlements in Central Asia and the Middle East (English 1966: 30; Frye 1996: 13). The karez continues to be especially important in southern Afghanistan because it is the only source of water for some villages. Water is ritually important in Islam and, as noted earlier (see Chapter Four), water management principles include the concepts that “water resources must be managed and used in a sustainable way” and that “sustainable and equitable water management” relies on fairness, equity, and concern (Faruqi 2001: 23). Water is essential for food security, especially when approximately 36% of the population is categorized as poor with 80% living below the poverty line (Hanasz 2011: 2; The World Bank 2010: 77). Access to water promotes food security that not only helps to improve the quality of lives for Afghans but also facilitates cohesion in the rebuilding process, thereby reducing the causes of social conflict. Food security will play a role in rebuilding both local communities and the state. Hanasz (2011: 1) notes, “access to staples and a level of basic nutrition has profound flow-on

effects for the cohesion, strength, and development of the population.” The importance of water and its contribution to food security and cohesion during the rebuilding phase also presents some ethical considerations that I discuss below, especially with the mapping of these water systems.

Political unrest and security issues in Afghanistan will continue to exist after U.S. and other international military forces withdraw. The decision to install pump wells as an alternative to karez water sources can be highly problematic. Military officials have offered to install diesel pump wells for villagers when their karez was adversely affected by military construction. However, spokesmen for villages have declined these offers, noting that the wells would not provide sufficient water to irrigate fields and that they themselves would be unable to afford diesel fuel and maintain the pumps (Fipps 2006: 1). This demonstrates rural villagers’ awareness of the difficulty of maintaining mechanically pumped wells once intervening actors leave Afghanistan. This must be taken into consideration in plans whose options should value and include traditional appropriate technology and the social practices that accompany its use.

#### **9.5.d Ethical Issues**

The use of remotely-sensed data to conduct research requires some ethical considerations. I will discuss the advantages and disadvantages of the use of Google Earth data for the identification and protection of archaeological resources. I will also discuss other ethical issues I encountered during the course of this study, including: 1) making available precise geographical coordinates for archaeological sites and 2) undertaking anthropological research with military funding.

Although high-resolution commercial satellite imagery such as SPOT or IKONOS is available for purchase by the public, Google Earth is free and accessible to anyone with an Internet connection and a computer. This resource is used as both a starting point and a method for conducting archaeological research (Contreras and Brodie 2010; Handwerk 2006; Kennedy and Bishop 2011; Myers 2010; Thomas, et al. 2008). From an archaeological perspective, Google Earth is advantageous because it provides a free platform from which research areas, including not only sites but localities and regions, can be viewed before fieldwork is conducted on the ground. Furthermore, Google Earth provides an efficient and easy-to-use platform by which to share data. Additionally, it facilitates “armchair archaeology” (Handwerk 2006), which is an advantage if the researcher is unable to enter the field due to safety concerns (Thomas, et al. 2008) and a disadvantage if data collected by remote sensing are not followed up with ground verification. Researchers who utilize remote sensing techniques in their projects stress the need for ground verification, especially because the results of most remotely sensed data are unclear, imprecise, and subject to misinterpretation.

Google Earth also has been used for humanitarian purposes. For example, specific and periodically updated images of prisons (Myers 2010), refugee camps (Mostrous 2008) such as those in the Darfur region (Parks 2009), and military bases can be readily viewed, allowing those concerned to monitor government and other activities (Homeland Security Newswire 2010; Page 2009). However, from any government’s perspective, this can be perceived as a disadvantage. Eisler (2008) notes that governments of some countries, including the United States, voiced concerns in 2005 when Google Earth made available world-wide satellite imagery for free over

the Internet.<sup>111</sup> The concerns were that the imagery would facilitate terrorist attacks (Harvey 2009) and activities by “hostile states” (Eisler 2008). The governments of India and South Korea have raised concerns that their buildings, military installations, and other significant sites can be viewed in Google Earth (Blakely 2008; Hafner and Rai 2005). Furthermore, Mistrata (2011) has asserted that Google Earth can assist the efforts of revolutionaries.

The availability of Google Earth is a concern for the protection and safety of archaeological resources because the coordinates of sites large enough to be detected in the imagery can be readily determined. This means that members of the general public can not only view these sites remotely, but also use a Geographical Positioning System (GPS) to go directly to them. This increases the likelihood that individuals with harmful intent will loot sites and compromise their archaeological integrity. Looting has already occurred as a result of the publication of Ball’s archaeological gazetteer (Omar Sultan, personal communication). Because I am mindful of the harm that may come to sites as a result of illicit use of data, the geographical coordinates of potential archaeological resources that I have identified are not published in my gazetteer (Appendix C). These data are on file and will be made accessible to qualified researchers through the Kansas Geological Survey in Lawrence, Kansas.

At the start of this project, I deliberated whether or not to accept funding from the Army Research Office (ARO). Various scholars (Price 2011, 2013) and other authors (Cohen 2009; Shachtman 2007; Weinberger 2007) discuss the ethical issues of working with the military, particularly as embedded anthropologists working on Human Terrain

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<sup>111</sup> In 2003, In-Q-Tel, which was a CIA-funded venture-capitalist firm, invested in Keyhole, Inc., the creator of EarthViewer 3D system. In 2004, Google Inc. acquired Keyhole Inc. and this laid the foundation for the development of Google Earth (CIA 2012).

System (HTS) teams. Price (2010, 2013: 58-59) argues that “countersurgency campaigns” will be successful in recruiting “anthropological assistance” due to the collapsing job market in anthropology and since “these calls” are “framed under the false flags of ‘humanitarian assistance or as reducing lethal engagements’”. However, contrary to Price’s opinion, there are ways in which anthropologists and the military can work cooperatively with the goal of humanitarian assistance. My research demonstrates the need to understand traditional water systems in Afghanistan from a cultural anthropological perspective. My research has not utilized any of the documents or reports gathered through the HTS program nor is this research associated with any HTS. From the onset, I accepted this research project because it focused on protecting cultural property and understanding the importance of traditional water systems. This project has mapped 50 karez systems within Maywand District. In so doing, it has provided the locations of systems that may be targeted for damage or alteration. However, potential harm can often result from unanticipated or uncontrolled use of data. My own goal has been to understand the historical and cultural the karez system in order to protect cultural heritage and reduce conflict. Given a lack of understanding of karezes, these systems were inadvertently modified by intervening actors, resulting in unnecessary tension in local communities. My aim is to reduce this through increased knowledge of these systems and their contexts.

I have given careful consideration to my decision to utilize remotely sensed data. Among the issues associated with these data are ones of the privacy and security of communities in Afghanistan and the security of U.S. military forces operating there. In selecting the imagery in this dissertation, I have avoided reproducing any that would

directly or even indirectly compromise the safety of either Afghan citizens or international military personnel. Another ethical dilemma presented itself after I began reviewing the study area and generating imagery for the archaeological gazetteer. Due to the quality of the imagery, it was clear how it could be used for intelligence gathering and related counter-insurgency efforts. For example, I identified and mapped several features that a Google search suggested could be tunnels used by either Taliban insurgents or local residents during times of conflict. Since the purposes of these were uncertain and I could not establish a direct relationship between these and water-related activities, I stopped mapping them. I have made every effort to avoid creating data that could be identified as intelligence gathering for counter-insurgency efforts.

I am opposed to the destruction of karez technology not only because it is ancient and historic and because karezes represent cultural property, but because they are often the only source of water for some villages. The deterioration of karez systems and the installation of mechanically pumped wells that run on diesel fuel perpetuate the dependency of rural villagers on international aid. This contributes to water and food insecurity and perpetuates sociopolitical instability, especially because it affects livelihoods and seasonal migrations. Karez instability can cause populations to migrate to other areas, resulting in property disputes and other detrimental stresses on the social organization of villages and communities. This sociopolitical instability reverberates not only at a local level that affects families and villages but throughout the region and also within the global arena.

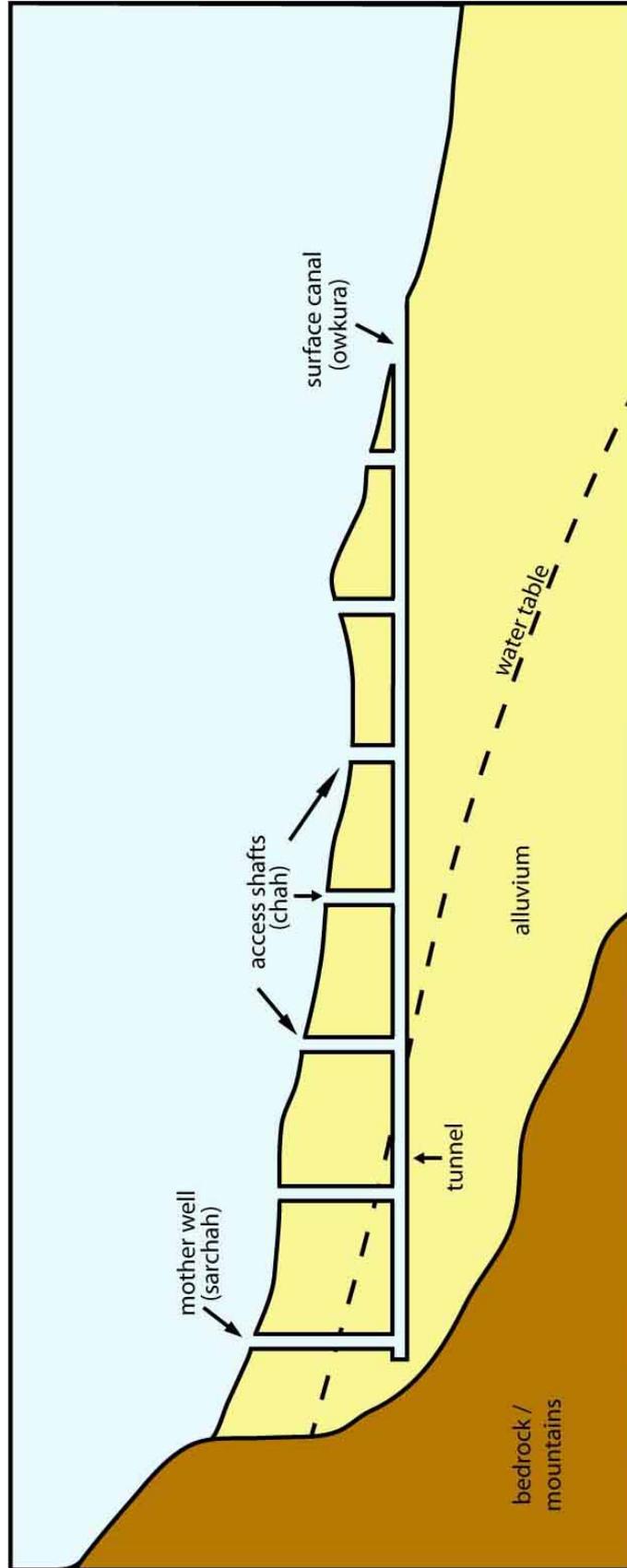
## 9.6 Future Directions and Final Considerations

My research provides just one case study of using remote sensing to assess the karez and archaeological resources of a specific and relatively small district in southern Afghanistan. Given the current political climate in Afghanistan, future research related to this case study in Maywand District and others pose challenges, not all of which are insurmountable. Future directions could include collecting comparative data from other regions, engaging in ground-truthing in Maywand District, undertaking additional remote sensing research, and disseminating this research through additional and multidisciplinary publications. One thesis that should be investigated is whether specific historic districts can be identified using remotely sensed imagery. The gazetteer provides an inventory that can become the basis for ground-truthing in a safer political climate. Until that is possible, comparative research can be conducted focusing on other regions in the Middle East and Central Asia. An issue that will no doubt be of interest to military planners and officials is addressing the specific impact of recent military activities on karez. An impact assessment should be carried out remotely using commercial satellite imagery from 2001 and later (e.g. 2010-2013) and the 2008 (USAGC) orthoimagery used for the Maywand study area.

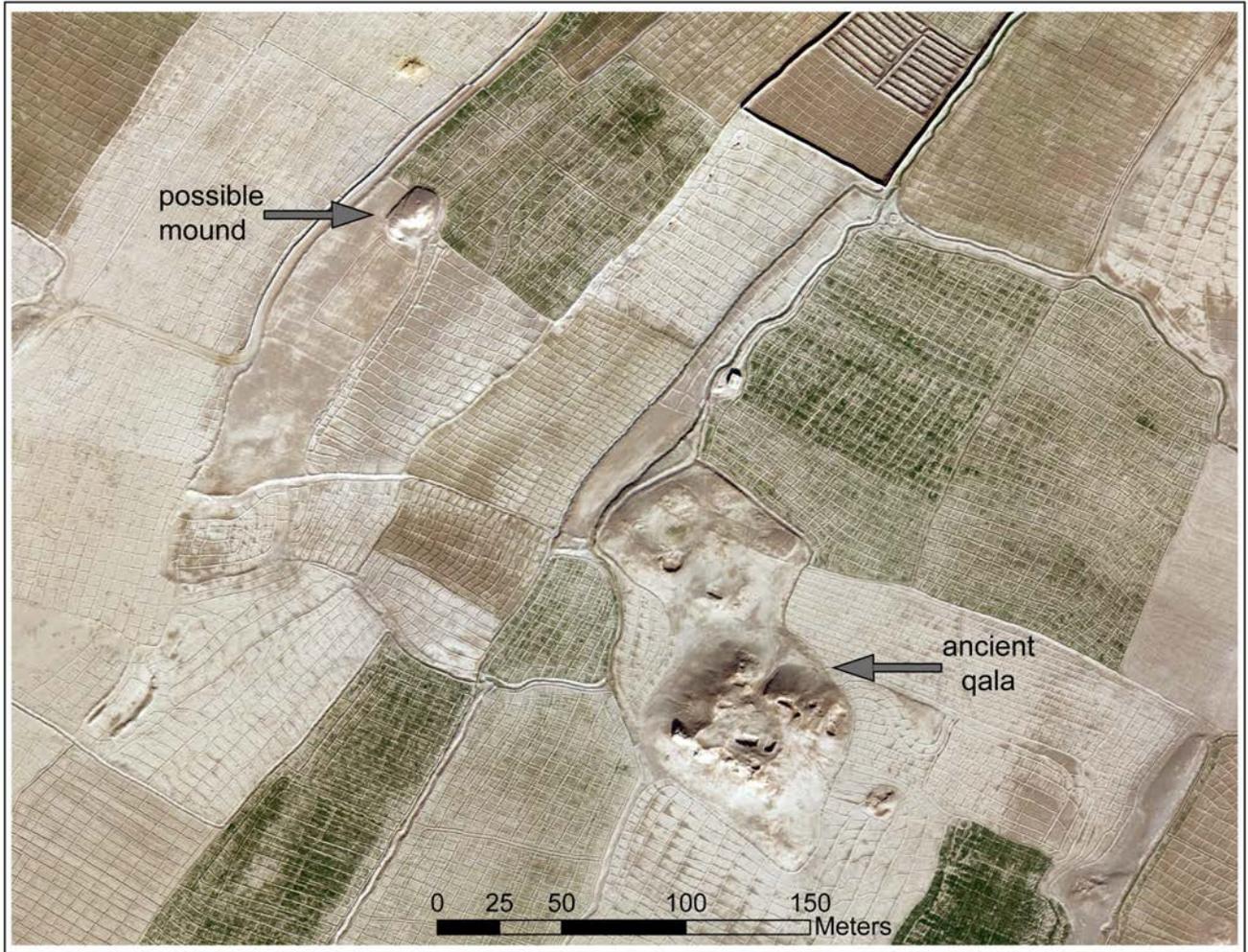
My research consolidates and analyzes data on the karez and Pashtun culture from a multitude of sources. It contributes to anthropological and archaeological interpretations not only of the study area but of other similar regions with similar forms of cultural property and associated populations. Dissemination of this research is vital even though the U.S. is currently withdrawing its troops from Afghanistan. I recommend the following venues: 1) to Provincial Reconstruction Teams (PRTs), since these teams

will continue to assist in reconstruction efforts in Afghanistan even after military officials withdraw their units; 2) to the Cultural Resources Management Program at Ft. Drum and the Center for Environmental Management of Military Lands (CEMML); and 3) to academic and military journals.

## X. FIGURES



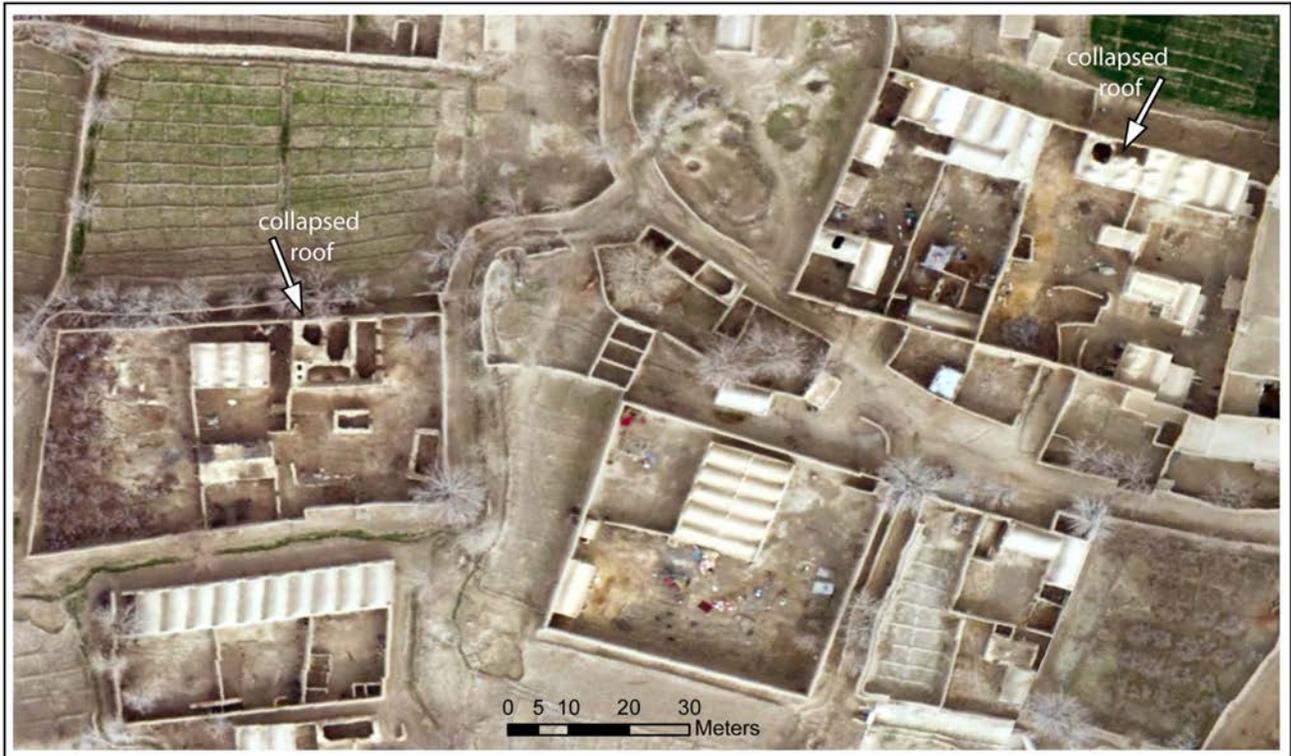
**Figure 1.** Karez schematic showing the mother well, individual access shafts, surface canal, and the underground tunnel (modified after English 1966:31; English 1968:171; Lightfoot 2009:3)



**Figure 2.** The avoidance of features on the landscape may represent the effects of memory and the importance of ancient features. It may also represent the need to utilize every possible meter or arable land. This image demonstrates that these features are noticeable in the orthorectified imagery since the agricultural fields avoid them (imagery courtesy of USAGC, 2008).



**Figure 3.** Differences in resolution of a qala in the study area in (top) the orthorectified imagery (imagery courtesy of USAGC, 2008) and (bottom) Google Earth™.



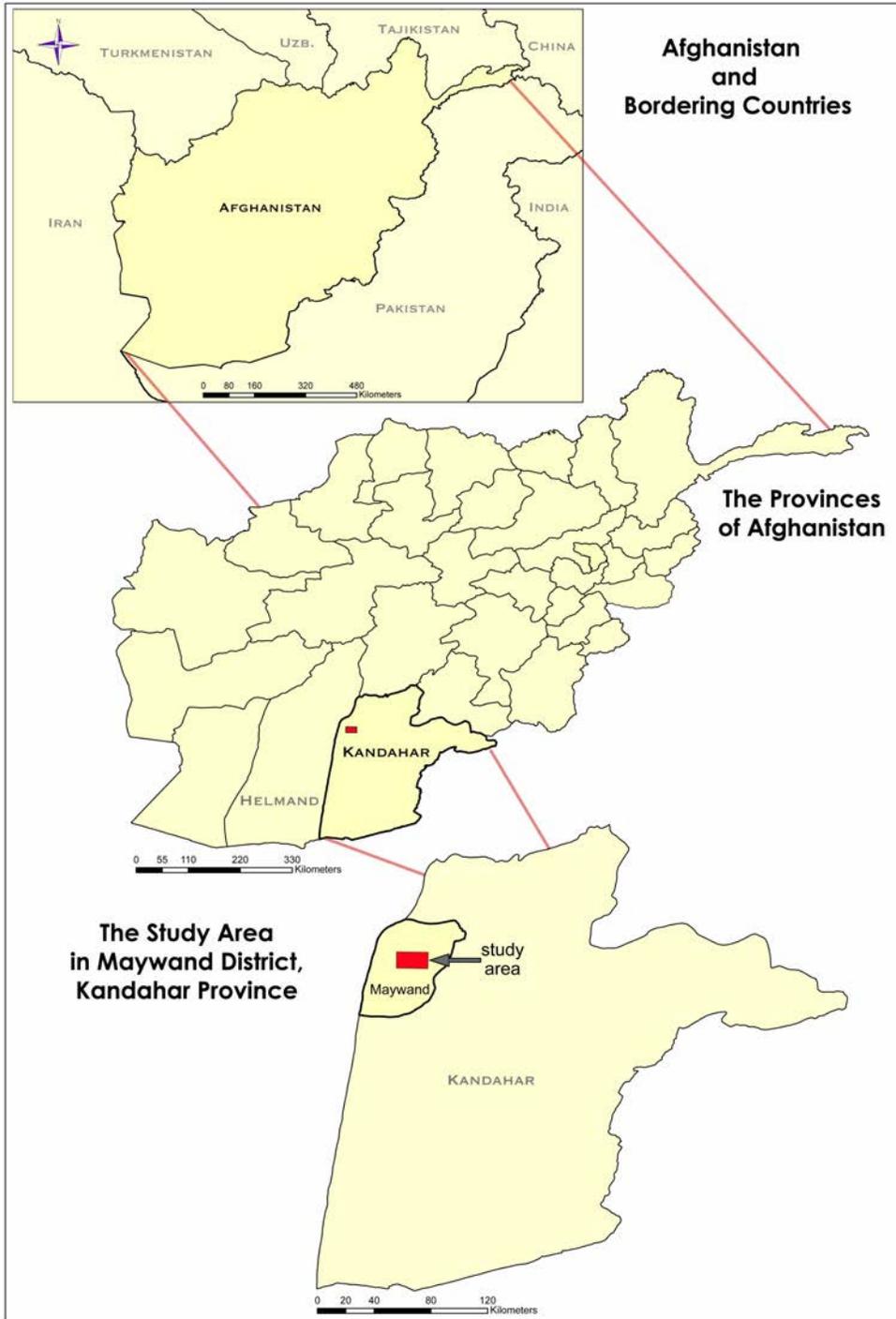
**Figure 4.** Aerial view of active and collapsed roofs, indicating structures currently in use as well as those that have been recently fallen into disrepair and have been either abandoned or repurposed (imagery courtesy of USAGC, 2008).



**Figure 5.** Example of a qala in the study area (Feature 32) (imagery courtesy of USAGC, 2008).



**Figure 6.** Example of a reused qala in the study area (Feature 24) (imagery courtesy of USAGC, 2008).



**Figure 7.** Study area in Maywand District, Kandahar Province.

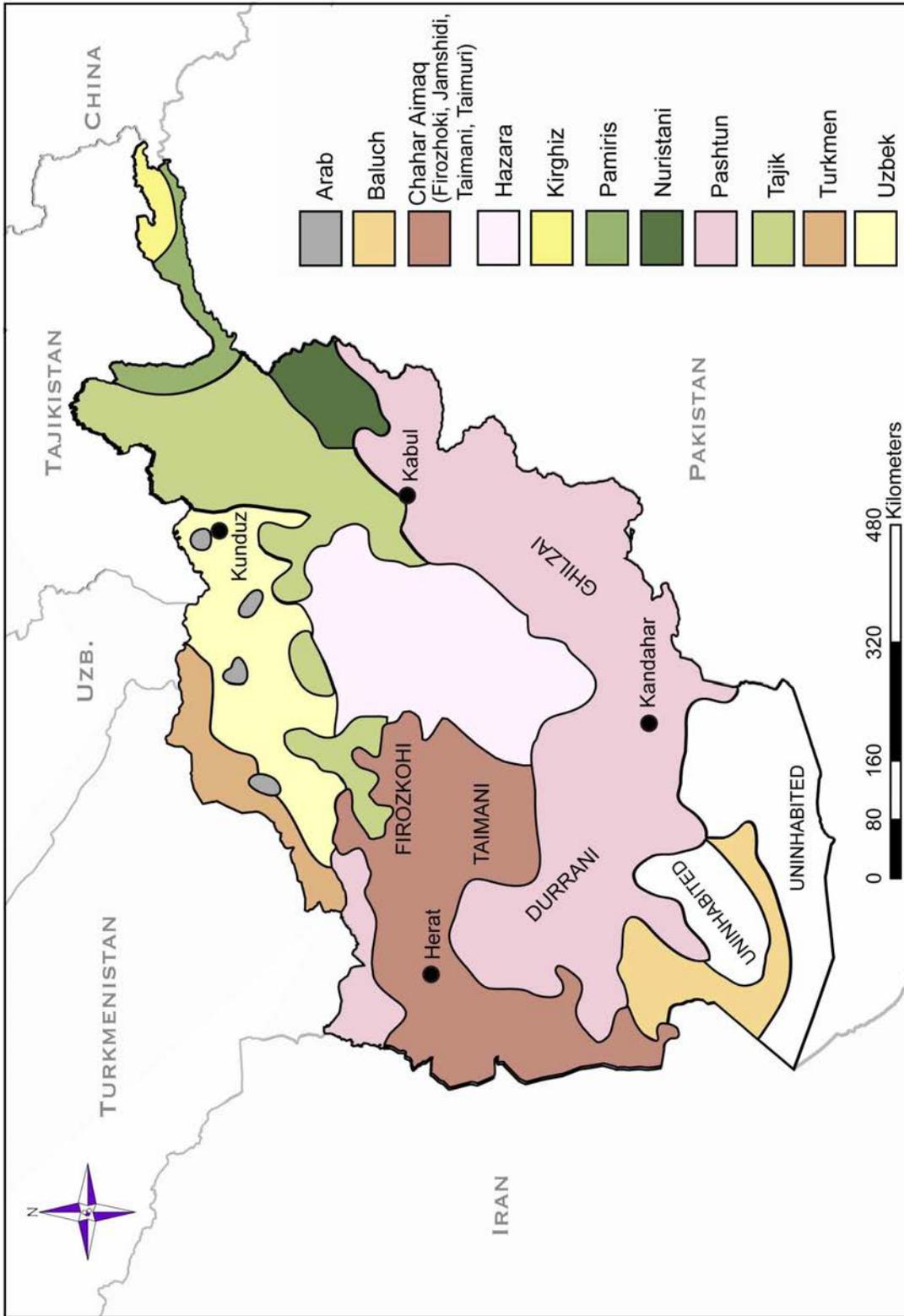
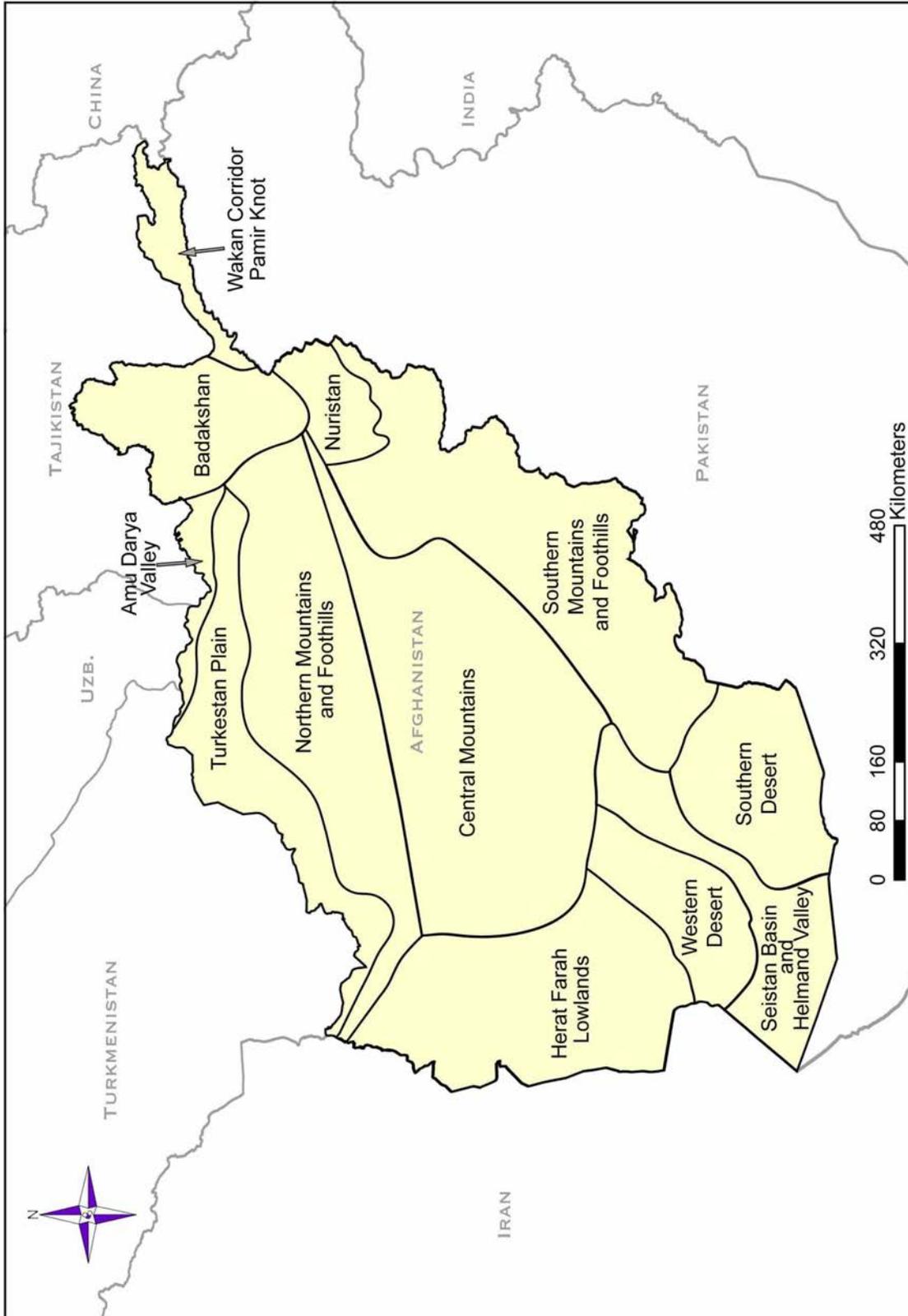
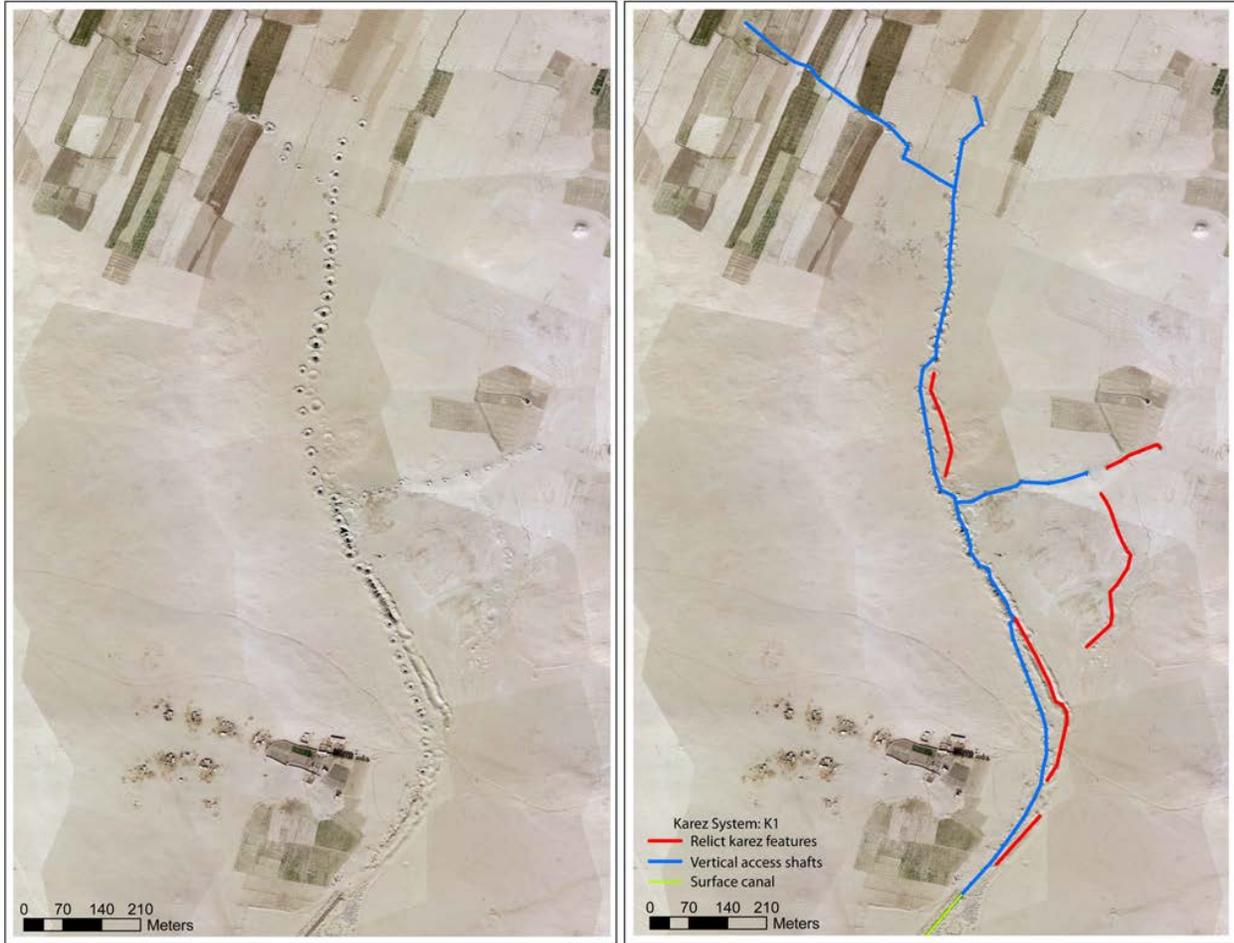


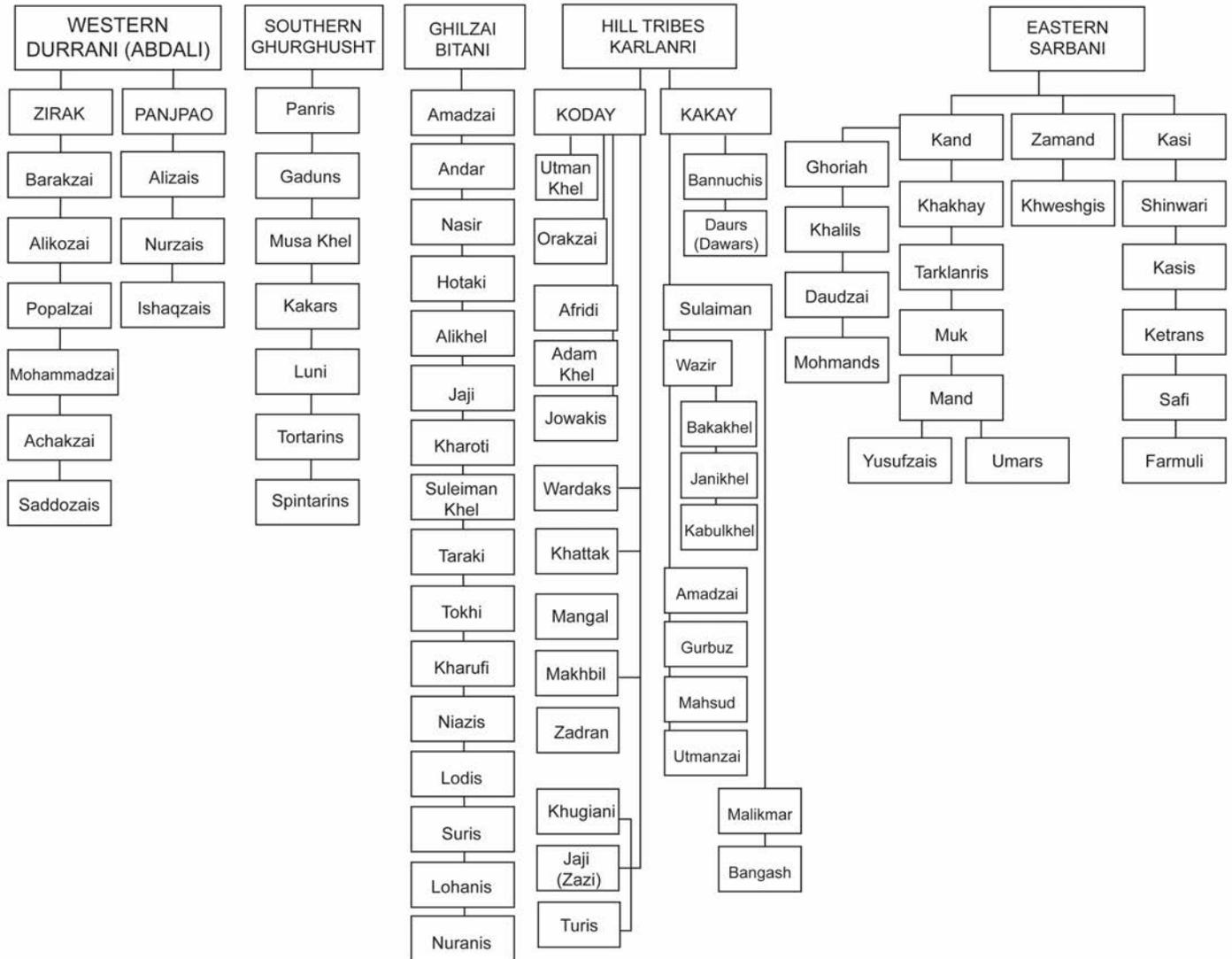
Figure 8. Ethnic groups and their distribution within Afghanistan.



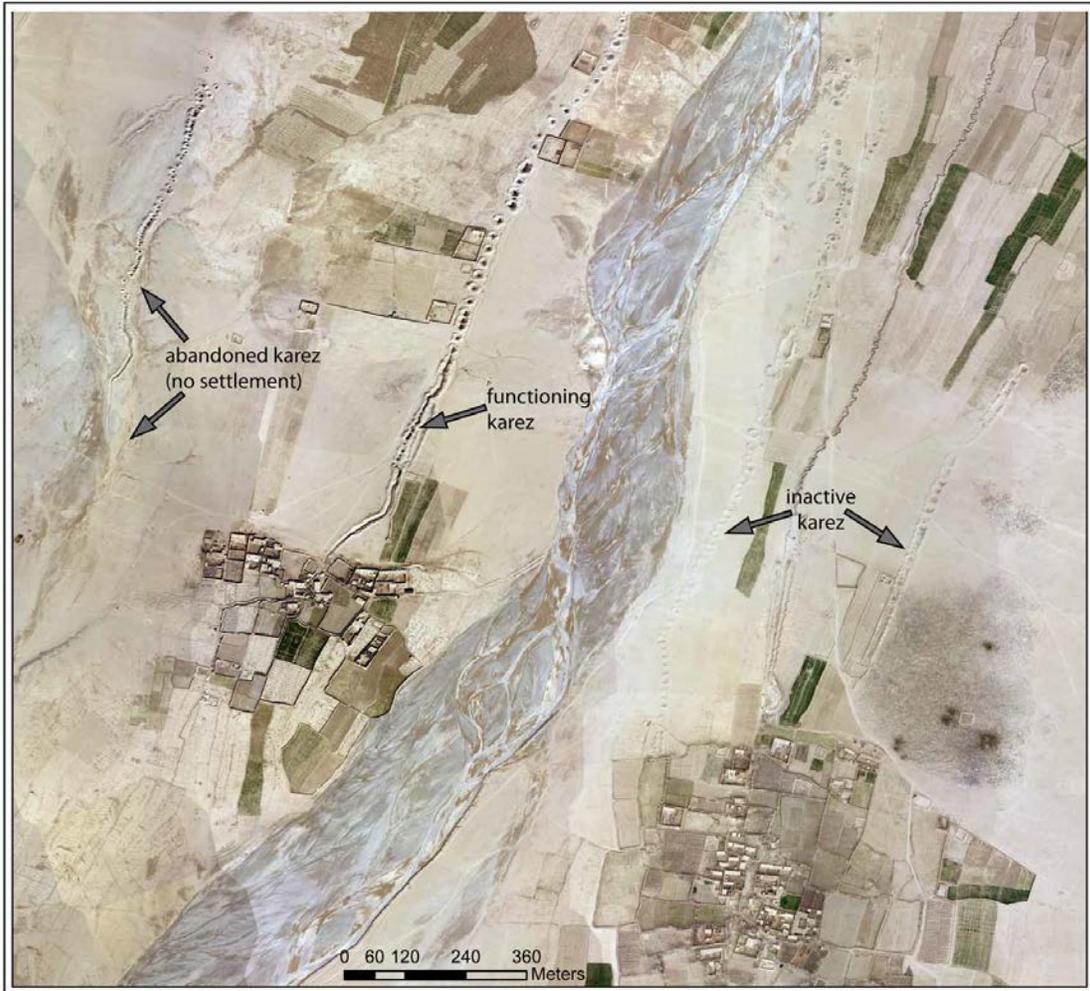
**Figure 9.** The physiographic regions of Afghanistan.



**Figure 10.** The karez appears as both active and relict features on the landscape (imagery courtesy of USAGC, 2008).



**Figure 11.** Pashtun groups and subgroups (redrawn after Afsar, et al. 2008:63)



**Figure 12.** Aerial view illustrating active and relict (not active) karez features on the landscape and how they lead into villages or are abandoned and not associated with a village (imagery courtesy of USAGC, 2008).

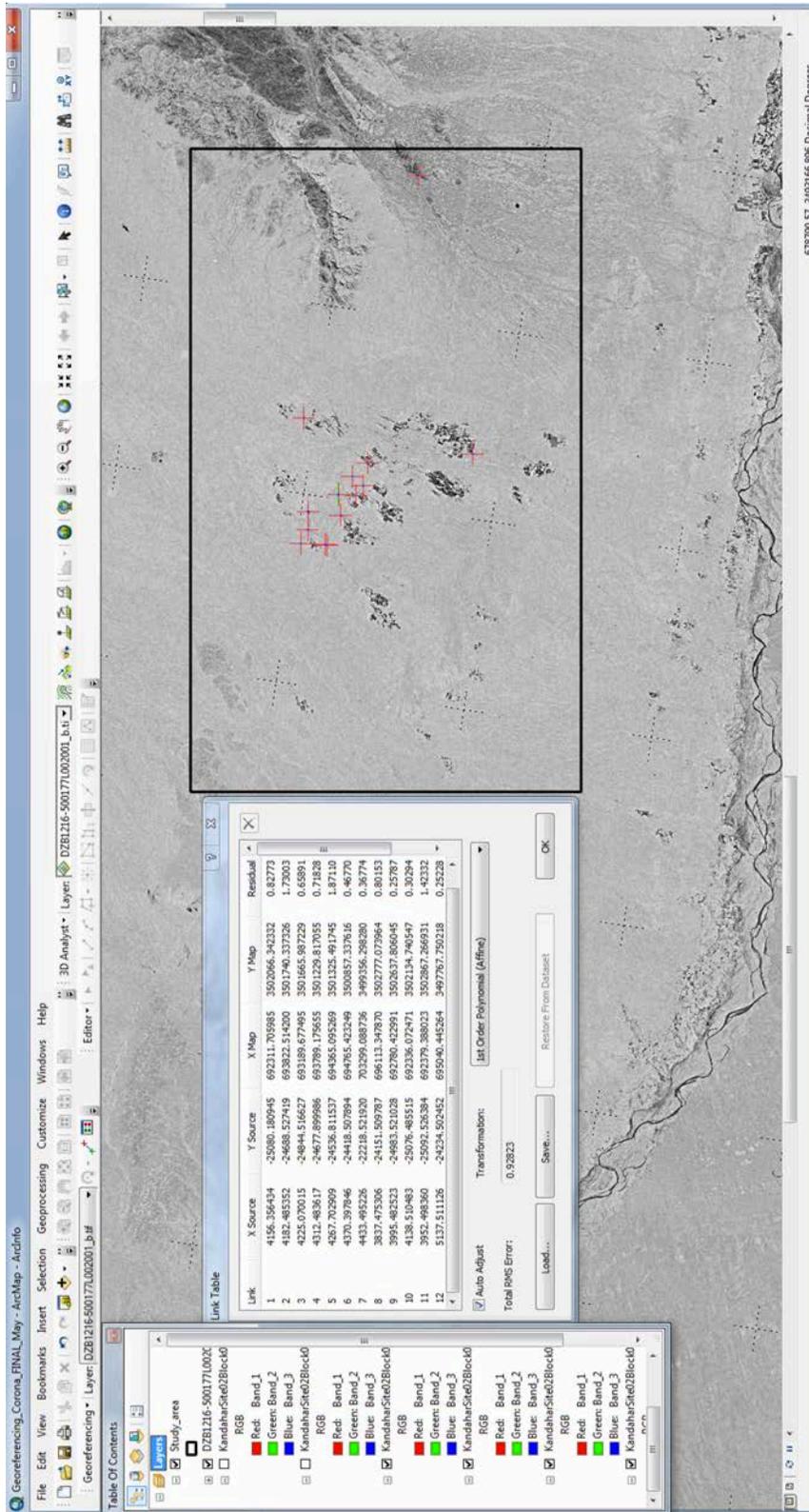
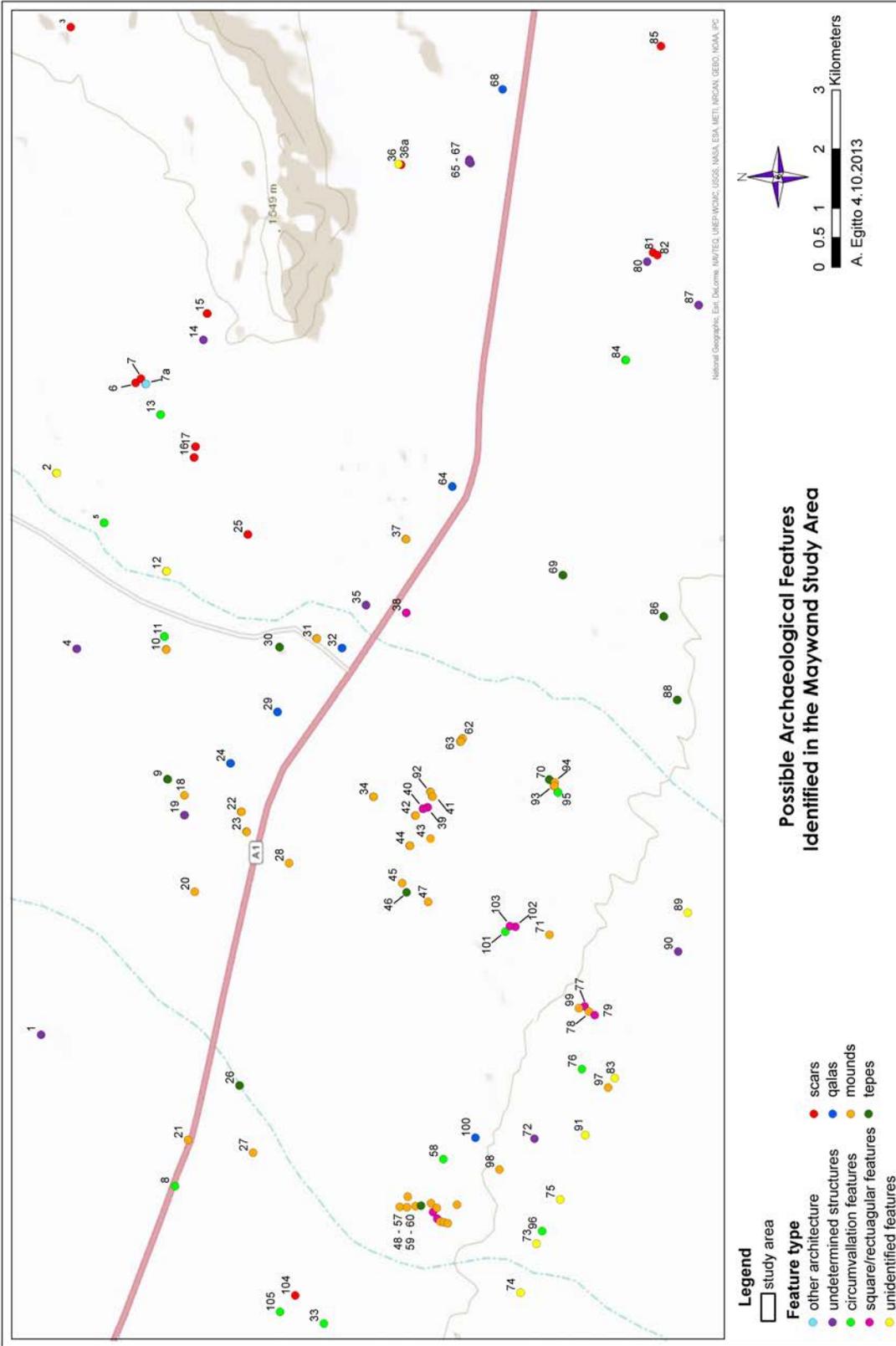
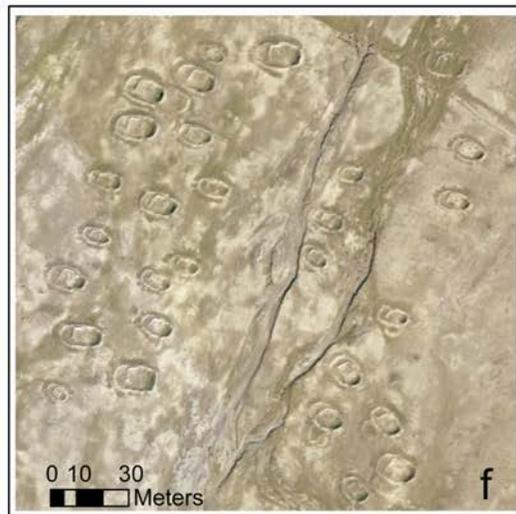
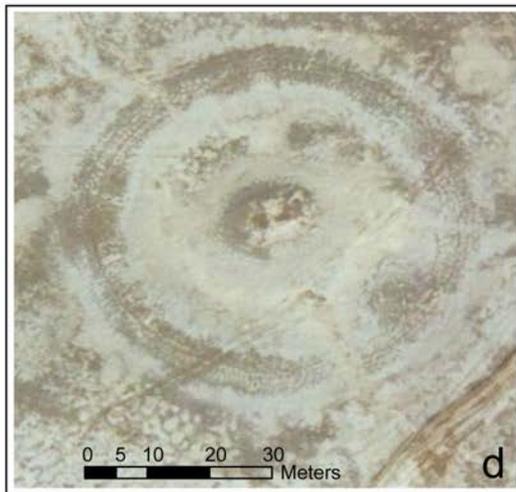


Figure 13. Screen shot of the Corona imagery within ArcGIS illustrating the ground control points (GCPs), root mean

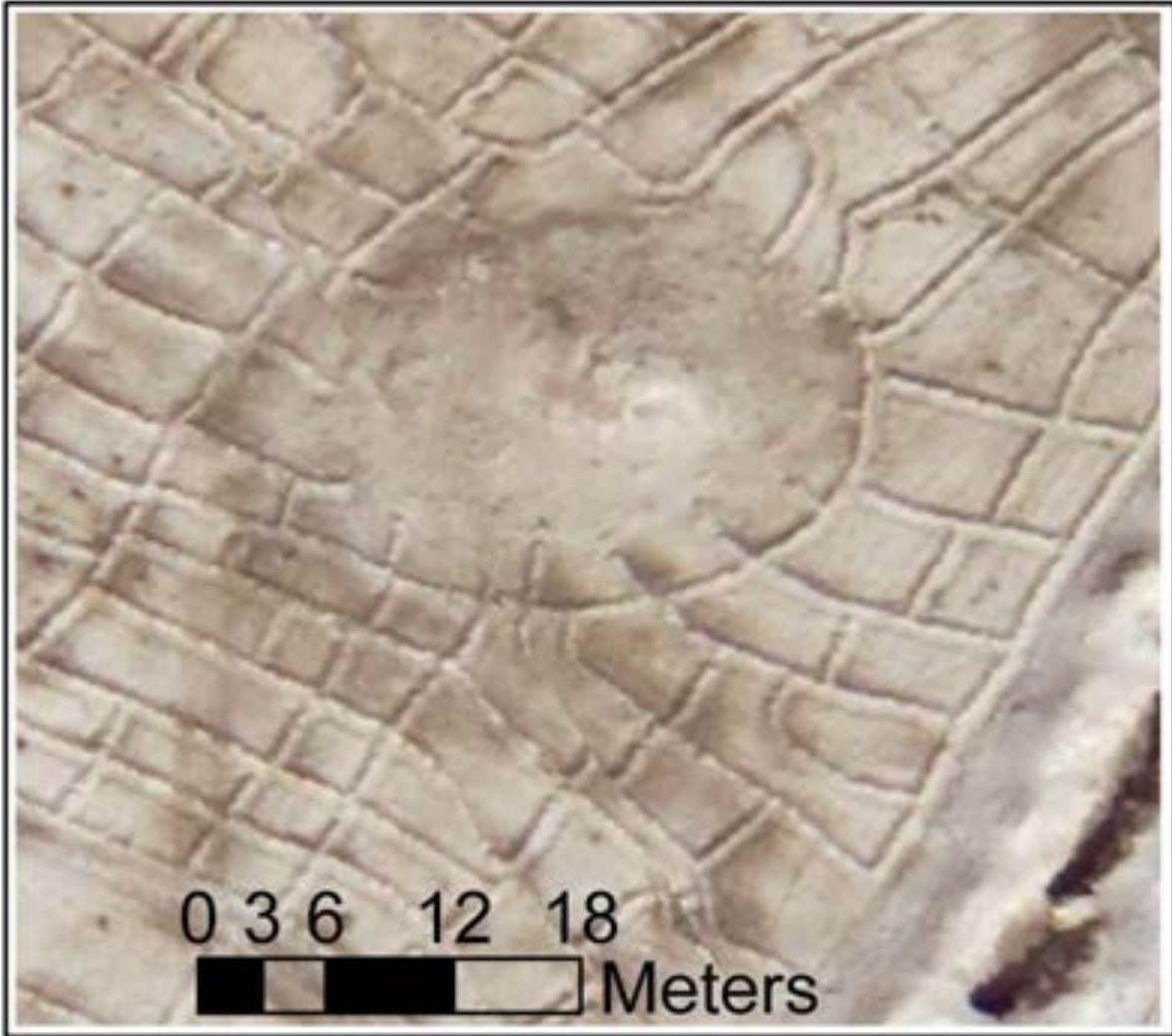


**Figure 14.** The identification and distribution of archaeological features in the study area.

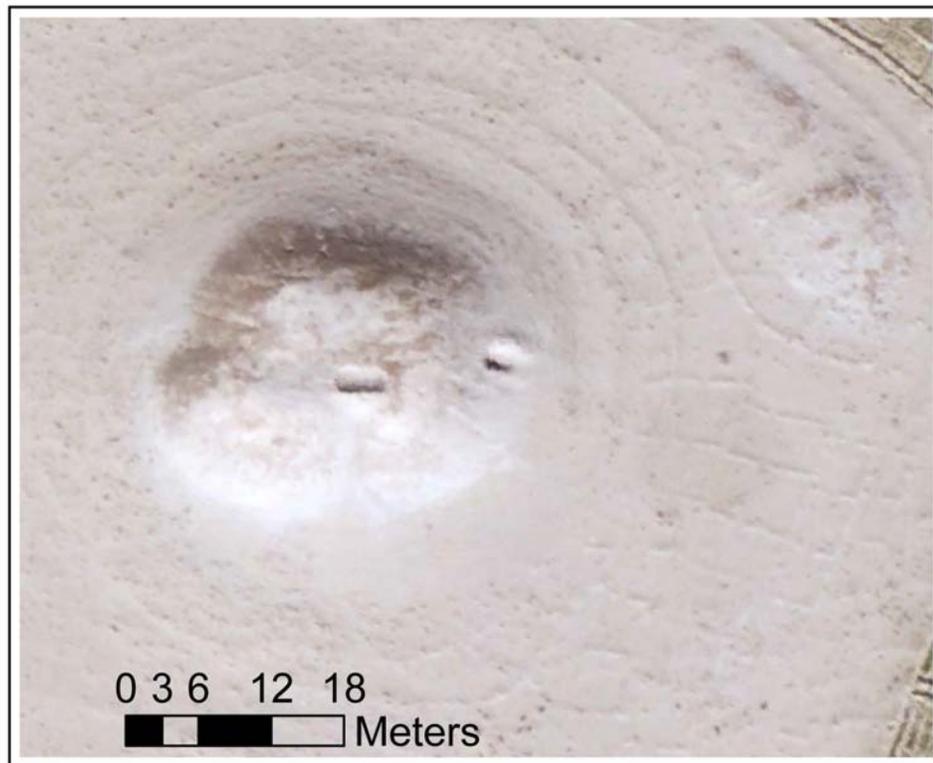
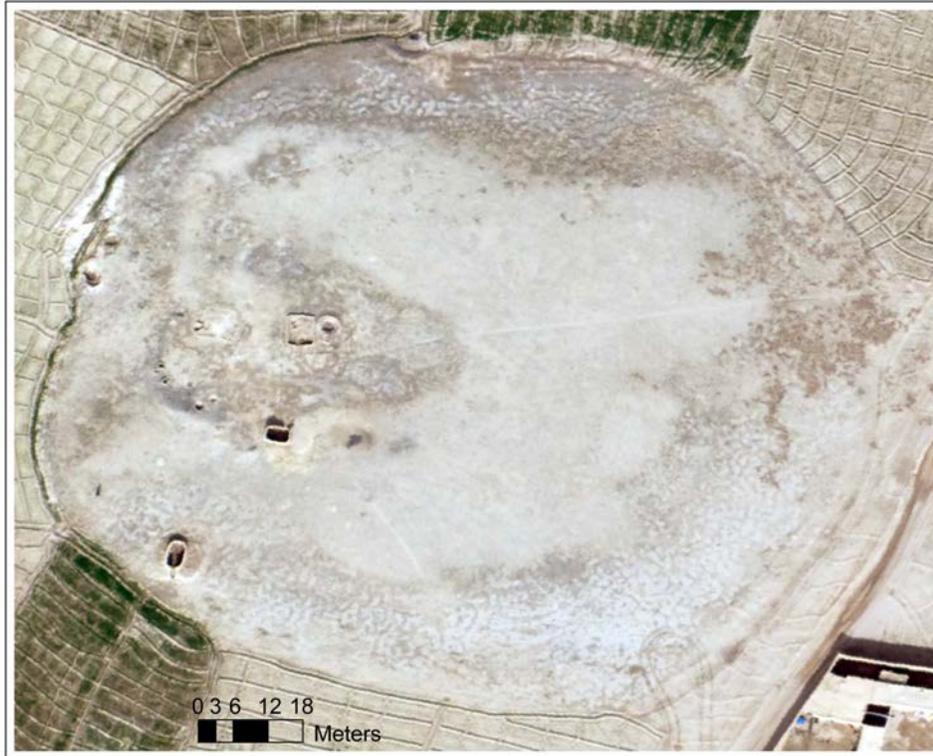




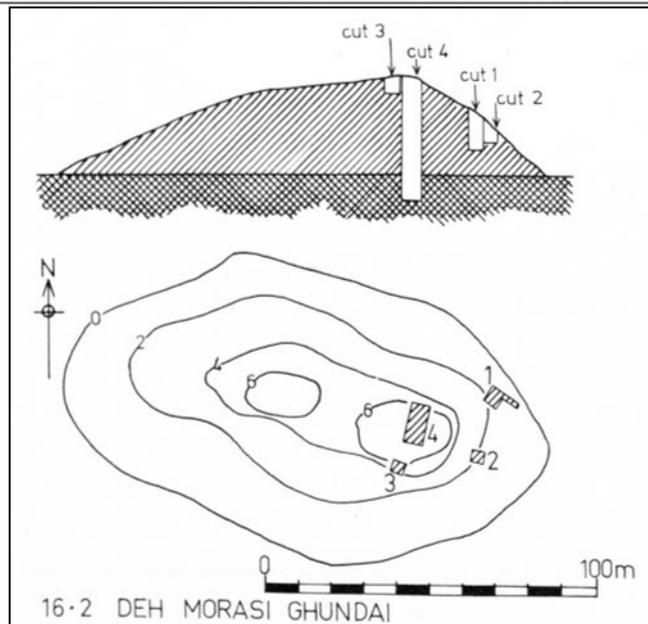
**Figure 15.** Examples of features identified in the study area: a) mound, b) tepe, c) qala, d) circular circumvallation feature, e) unique structure, f) scars (nomadic encampments) (imagery courtesy of USAGC, 2008).



**Figure 16.** An example of a mound in the study area (Feature 59) (imagery courtesy of USAGC, 2008).



**Figure 17.** Examples of tepes found in the study area (Feature 46, top; Feature 69, bottom) (imagery courtesy of USAGC, 2008).



**Figure 18.** Feature 26 (top, imagery courtesy of USAGC, 2008) resembles the site of **DEH MORASI GHUNDAI** (below), also in Kandahar Province, although Feature 26 is slightly smaller. **DEH MORASI GHUNDAI** dates to the Chalcolithic period (Ball 2008:45; Dupree 1973:266).



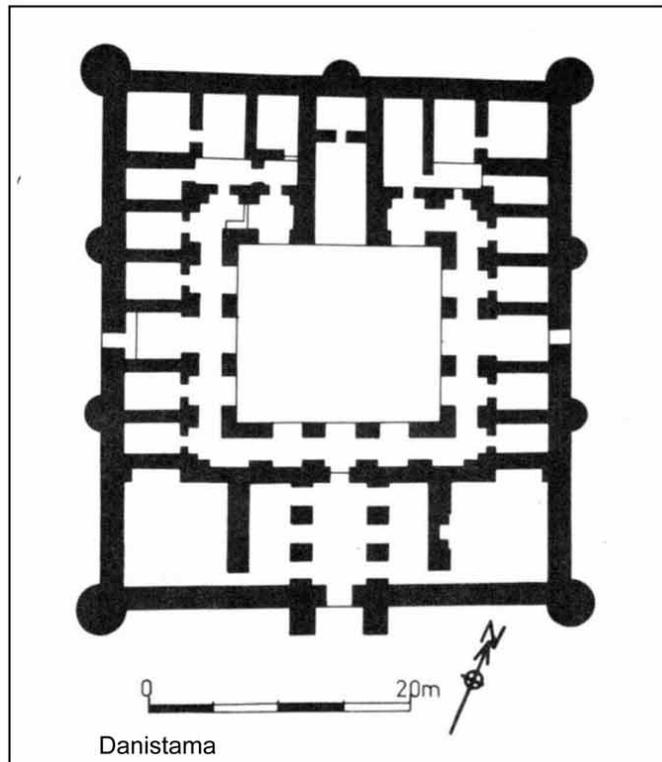
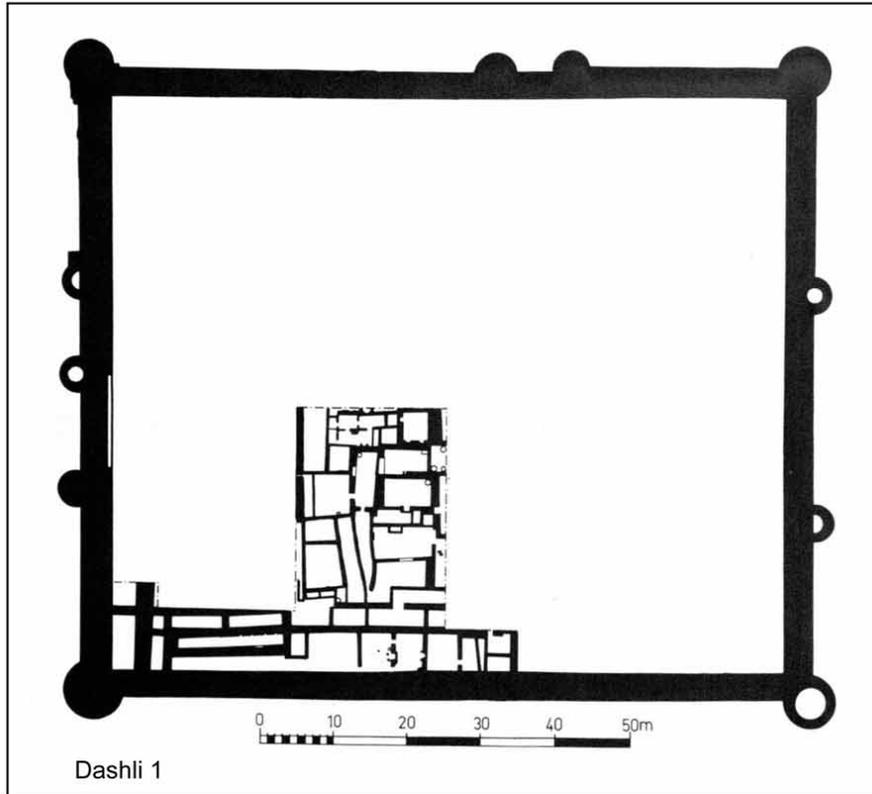
**Figure 19.** Examples of mounds that have been reused for cemeteries in the study area (Feature 63, top; Feature 99, bottom) (imagery courtesy of USAGC, 2008).



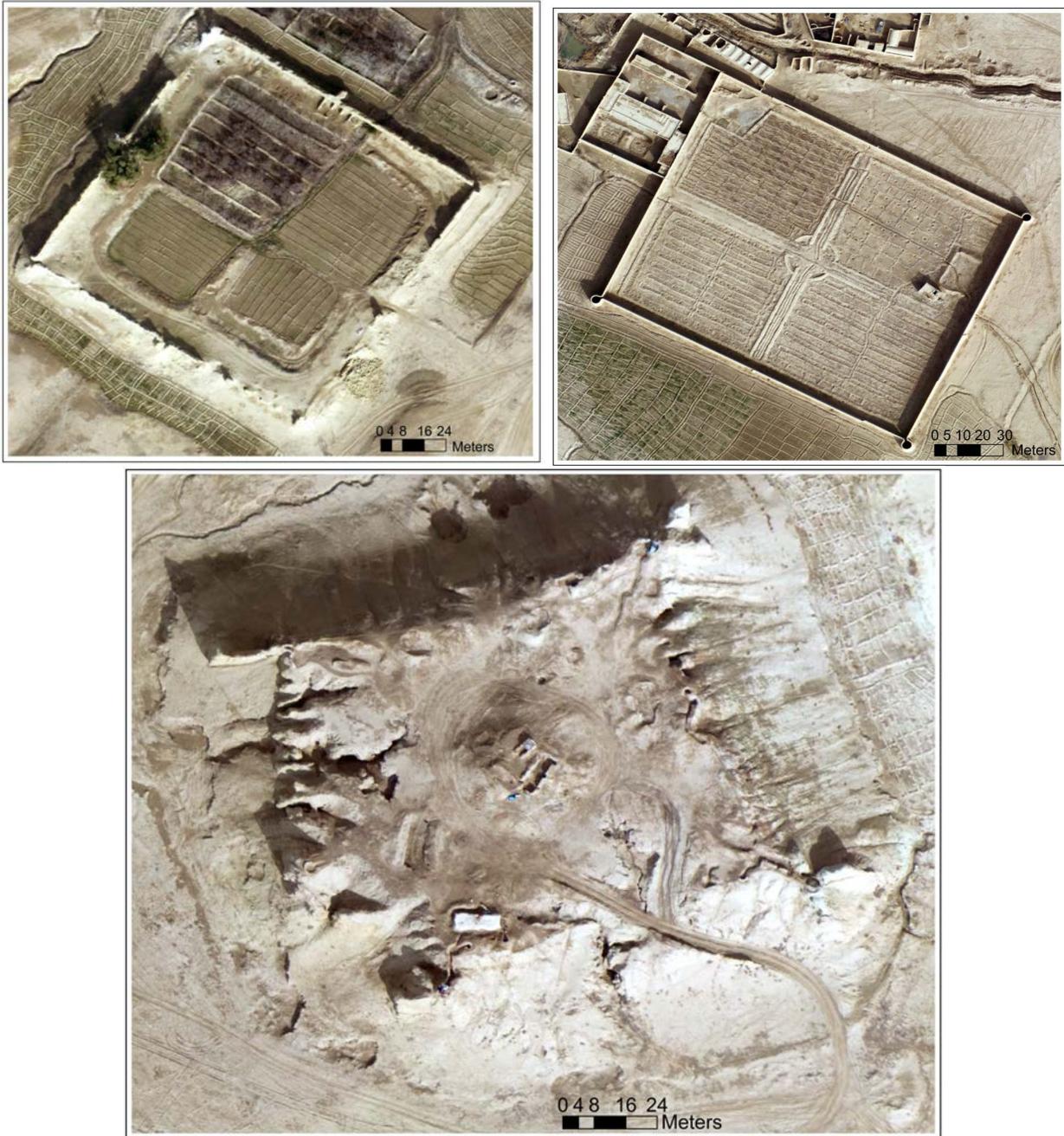
**Figure 20.** An example of a mound that has been reused with impact from agricultural and rural development (Feature 43) (imagery courtesy of USAGC, 2008).



**Figure 21.** Examples of qalas in the study area (Feature 32, top and Feature 68, bottom) (imagery courtesy of USAGC, 2008).



**Figure 22.** Structures made of mud-brick: Dashli 1 (left) and Danistama (right) (Ball 1982:431, 432).



**Figure 23.** Examples of qalas reused for agricultural purposes (Feature 24, top left; Feature 100, top right) and modern habitation (Feature 29, bottom) (imagery courtesy of USAGC, 2008).



**Figure 24.** An example of a modern feature constructed in the architectural style of the qala (Feature 64) (imagery courtesy of USAGC, 2008).



**Figure 25.** Examples of square/rectangular structures (Feature 39, top; Feature 54, bottom) (imagery courtesy of USAGC, 2008).



**Figure 26.** Examples of undetermined structures (Feature 4, top; Feature 90, bottom) (imagery courtesy of USAGC, 2008).



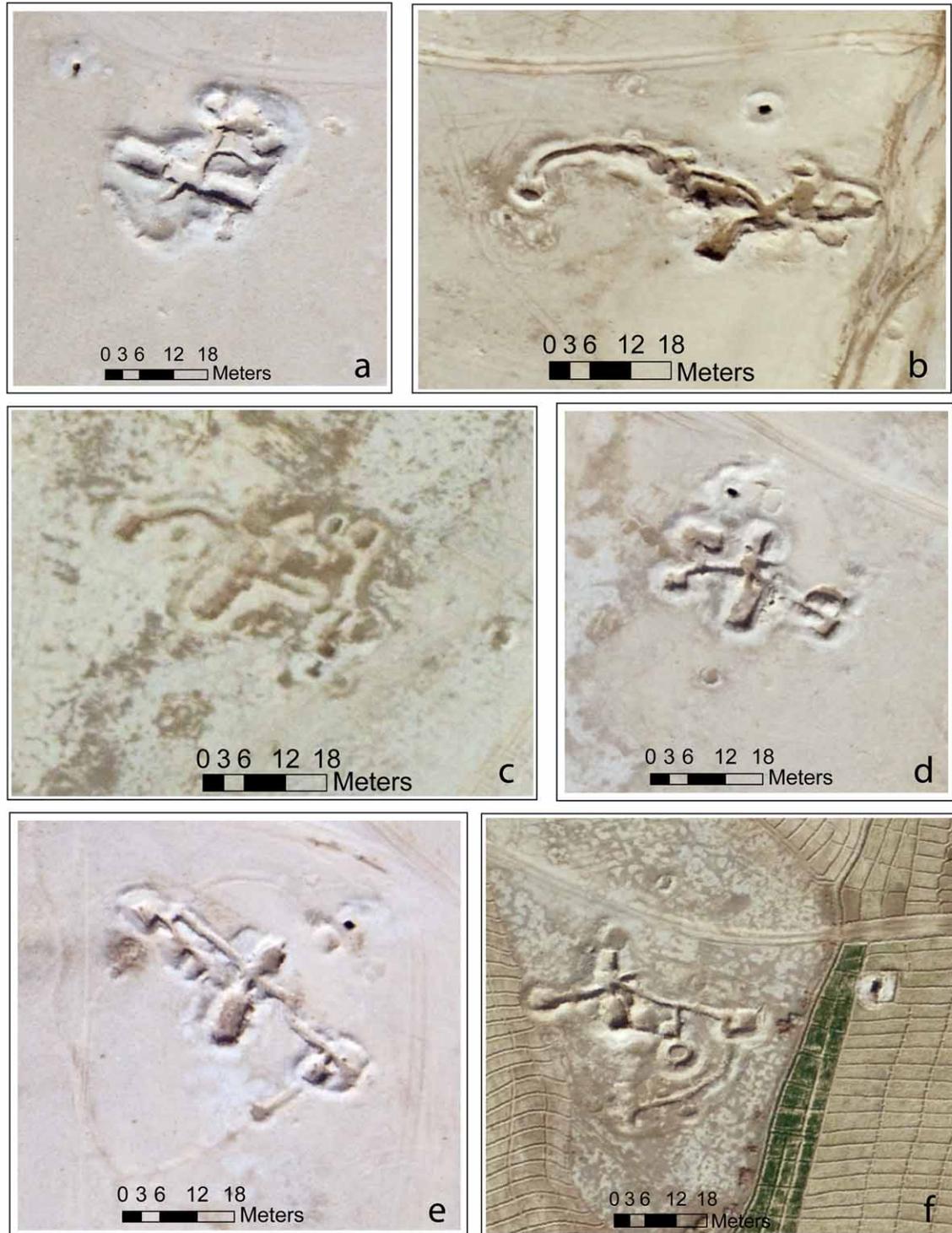
**Figure 27.** Examples of circumvallation features (Figure 5, top; Figure 58 bottom) (imagery courtesy of USAGC, 2008).



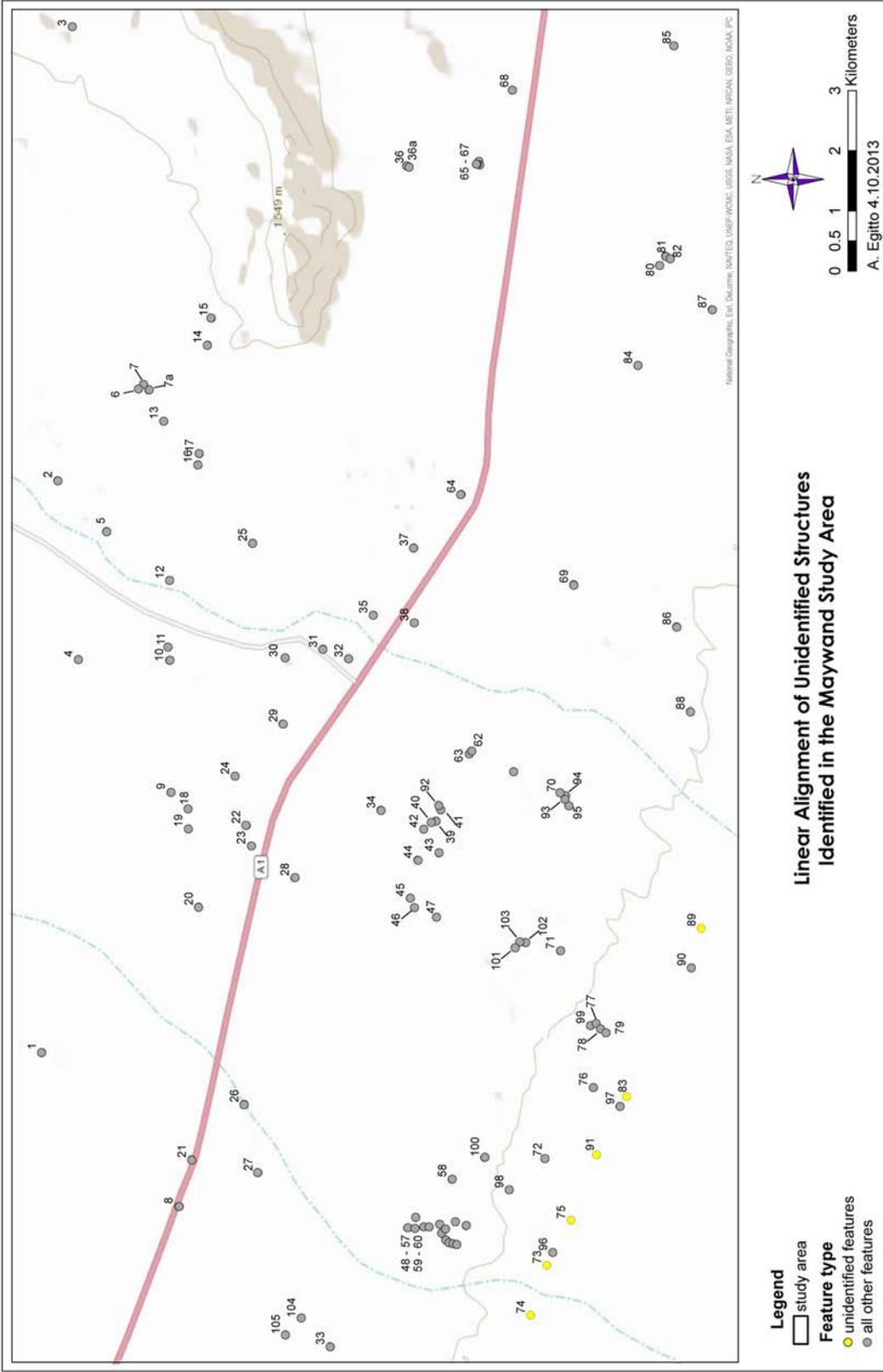
**Figure 28.** An example of an Unidentified Structure: A (Feature 2) (imagery courtesy of USAGC, 2008).



**Figure 29.** An example of an Unidentified Structure: B (Feature 12) (imagery courtesy of USAGC, 2008).



**Figure 30.** Examples of unidentified structures (a) Feature 74, (b) Feature 89, (c) Feature 83, (d) Feature 75, (e) Feature 73, and (f) Feature 91 (imagery courtesy of USAGC, 2008).



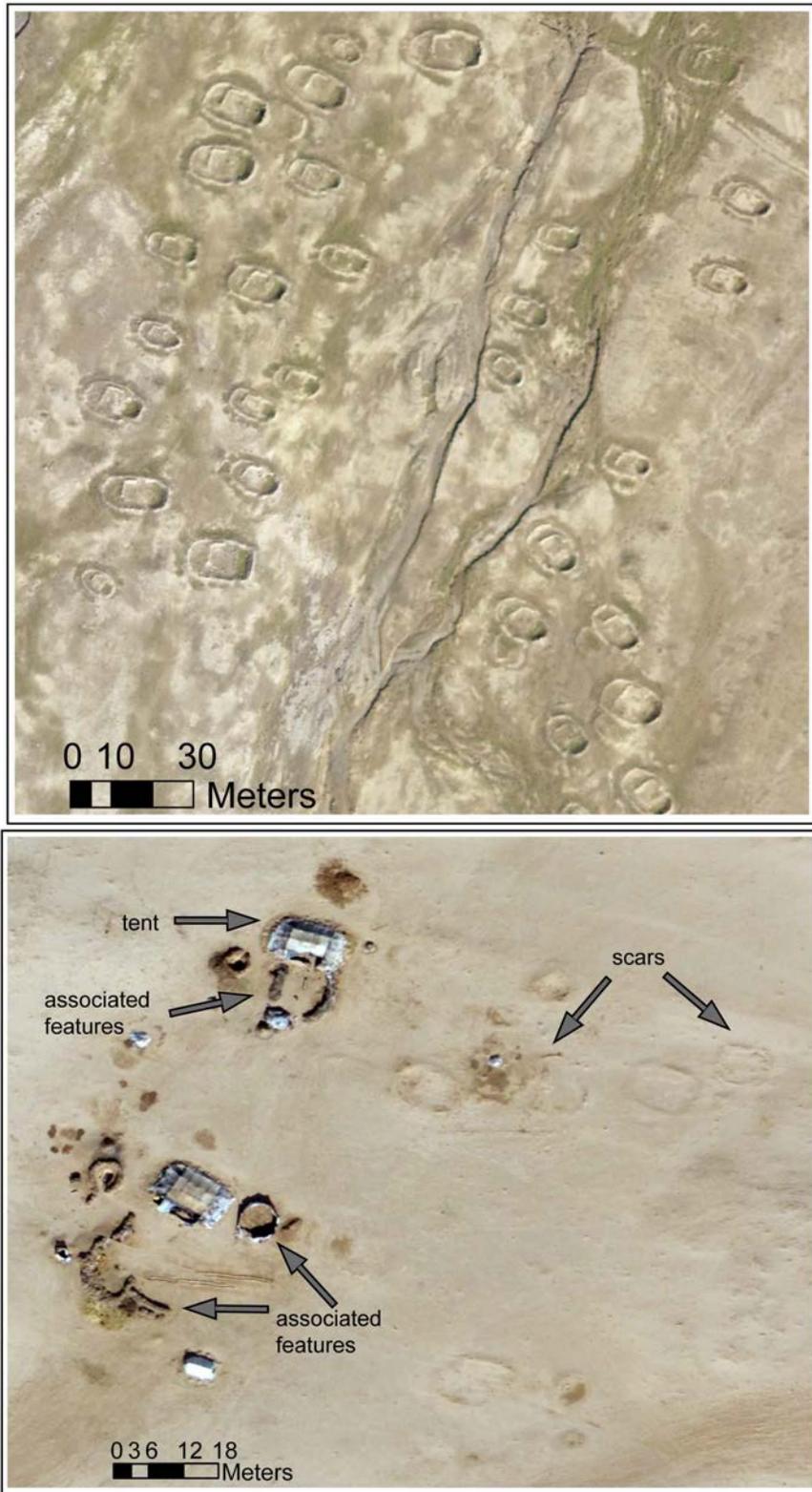
**Figure 31.** Map of linear alignment of unidentified structures in the study area (imagery courtesy of USAGC, 2008).



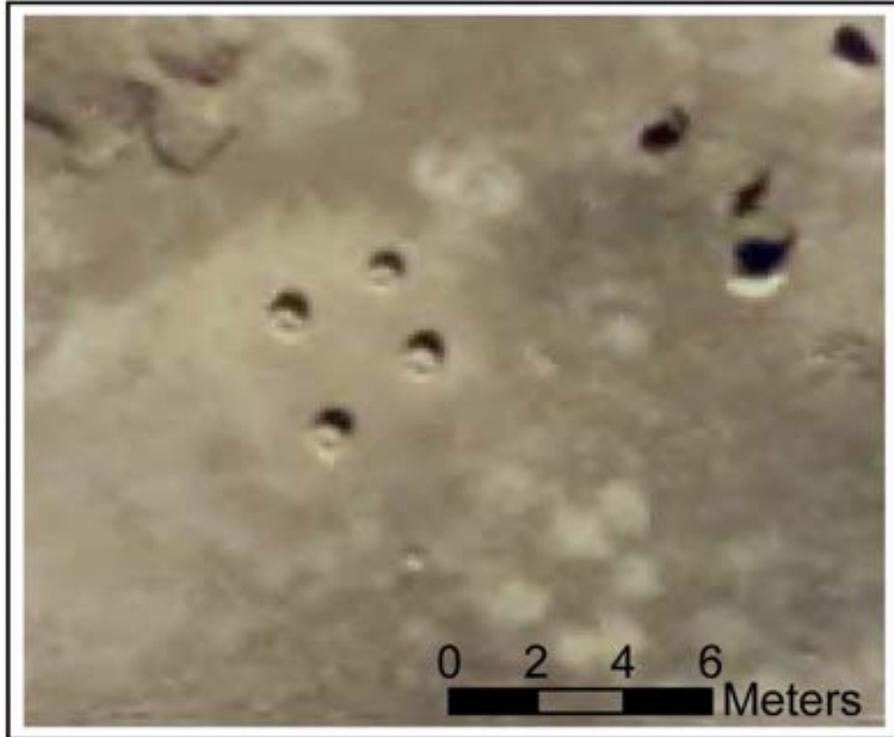
**Figure 32.** Examples of scars found on the landscape: the remains of low oval walls associated with nomadic encampments (Feature 16, top) and undetermined square scars that may also be associated with nomadic encampments but of an unidentified group and housing style (Feature 82, bottom) (imagery courtesy of USAGC, 2008).



**Figure 33.** Feature 25 contains unidentified square scars in association with the remains of low walls from nomadic or semi-sedentary encampments (imagery courtesy of USAGC, 2008).



**Figure 34.** Comparison of features identified as scars (Feature 85, top) to tents and similar scars in proximity (bottom) (imagery courtesy of USAGC, 2008).



**Figure 35.** Example of a feature identified as other architecture (Feature 7a) (imagery courtesy of USAGC, 2008).

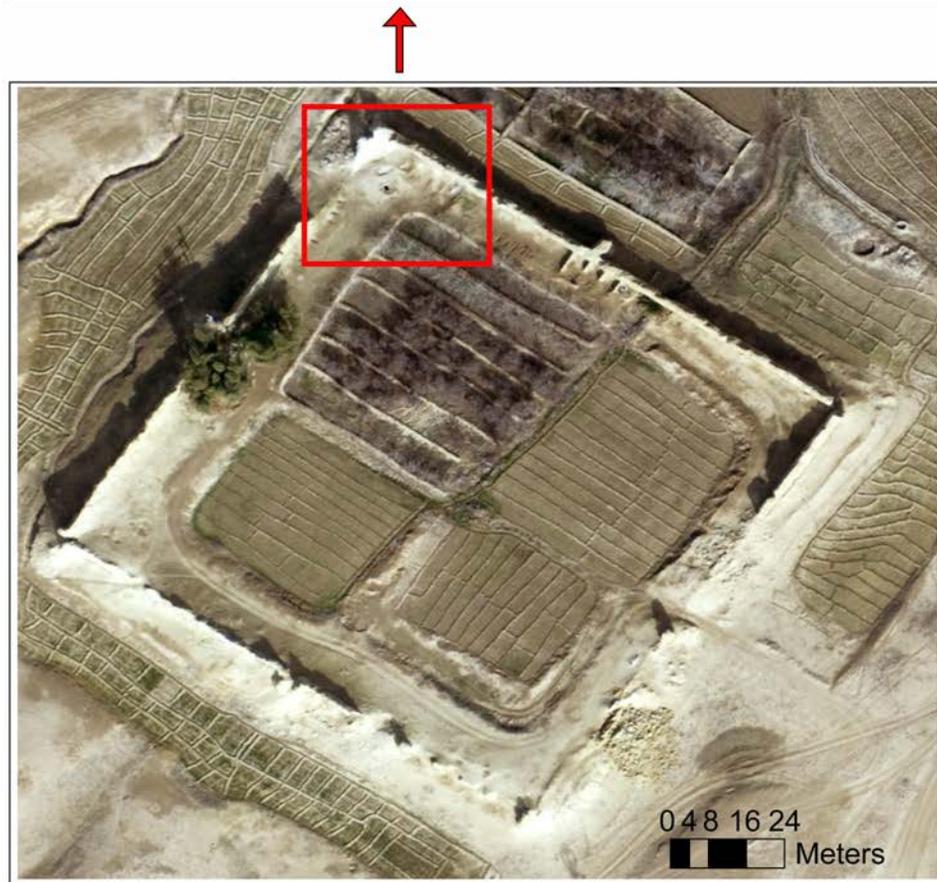


(Mizuno 1969: plate 4.1)

**Figure 36.** Example of columns at Tepe Durman.



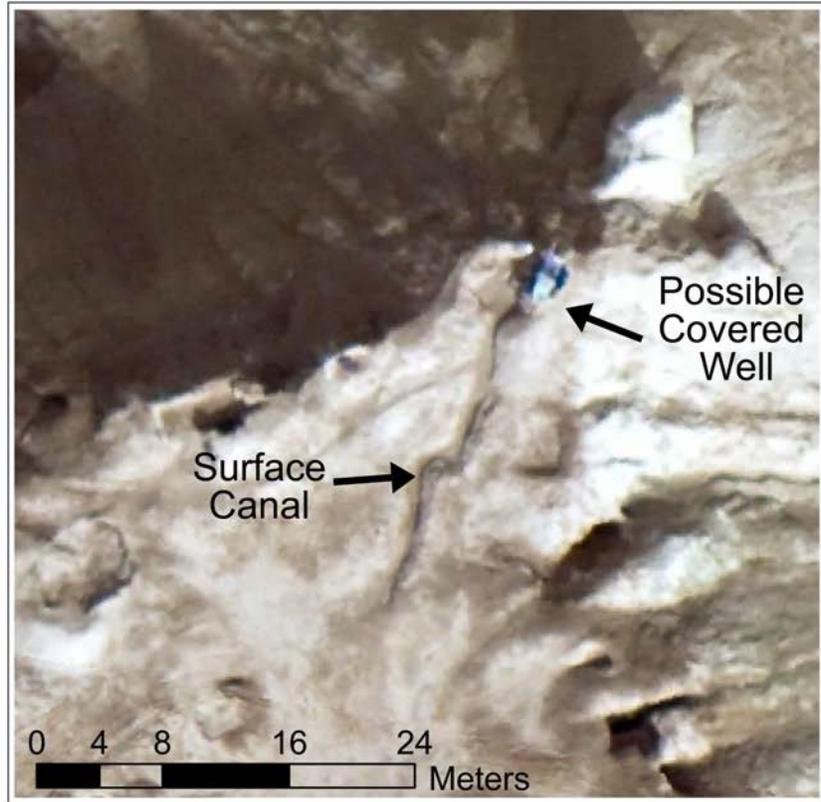
**Figure 37.** There are several karez that are in proximity of archaeological features (imagery courtesy of USAGC, 2008).



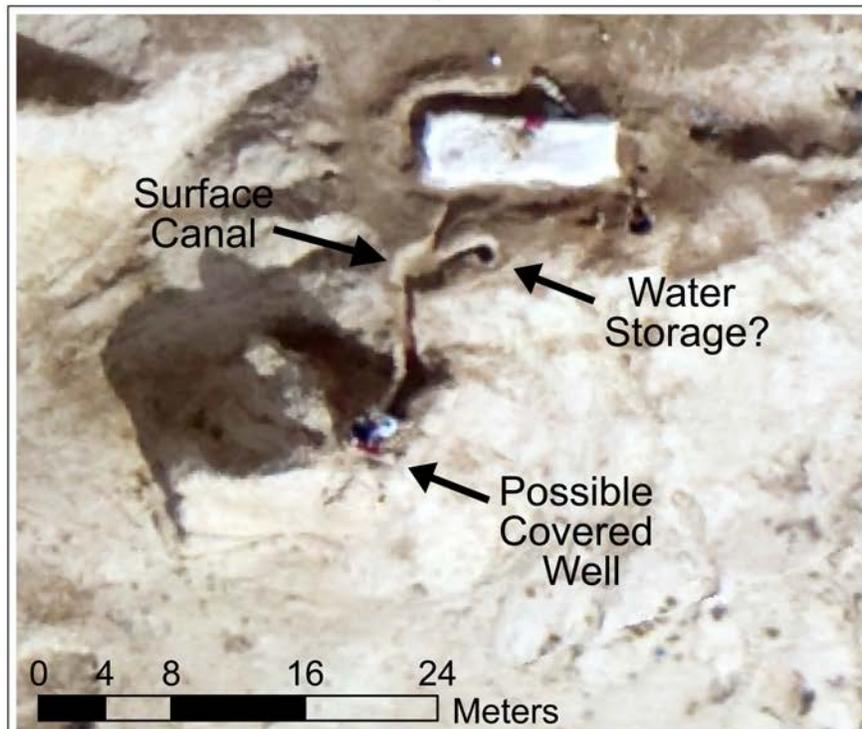
**Figure 38.** A possible well is situated inside the qala walls (Feature 24) (imagery courtesy of USAGC, 2008).



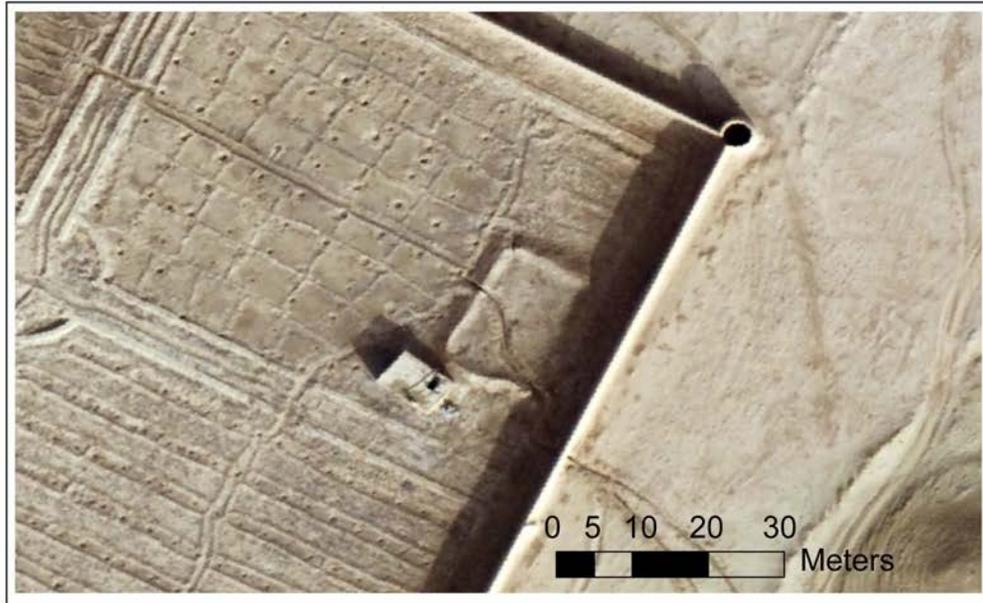
**Figure 38.** Two possible wells with surface canals are associated with Feature 29 (imagery courtesy of USAGC, 2008).



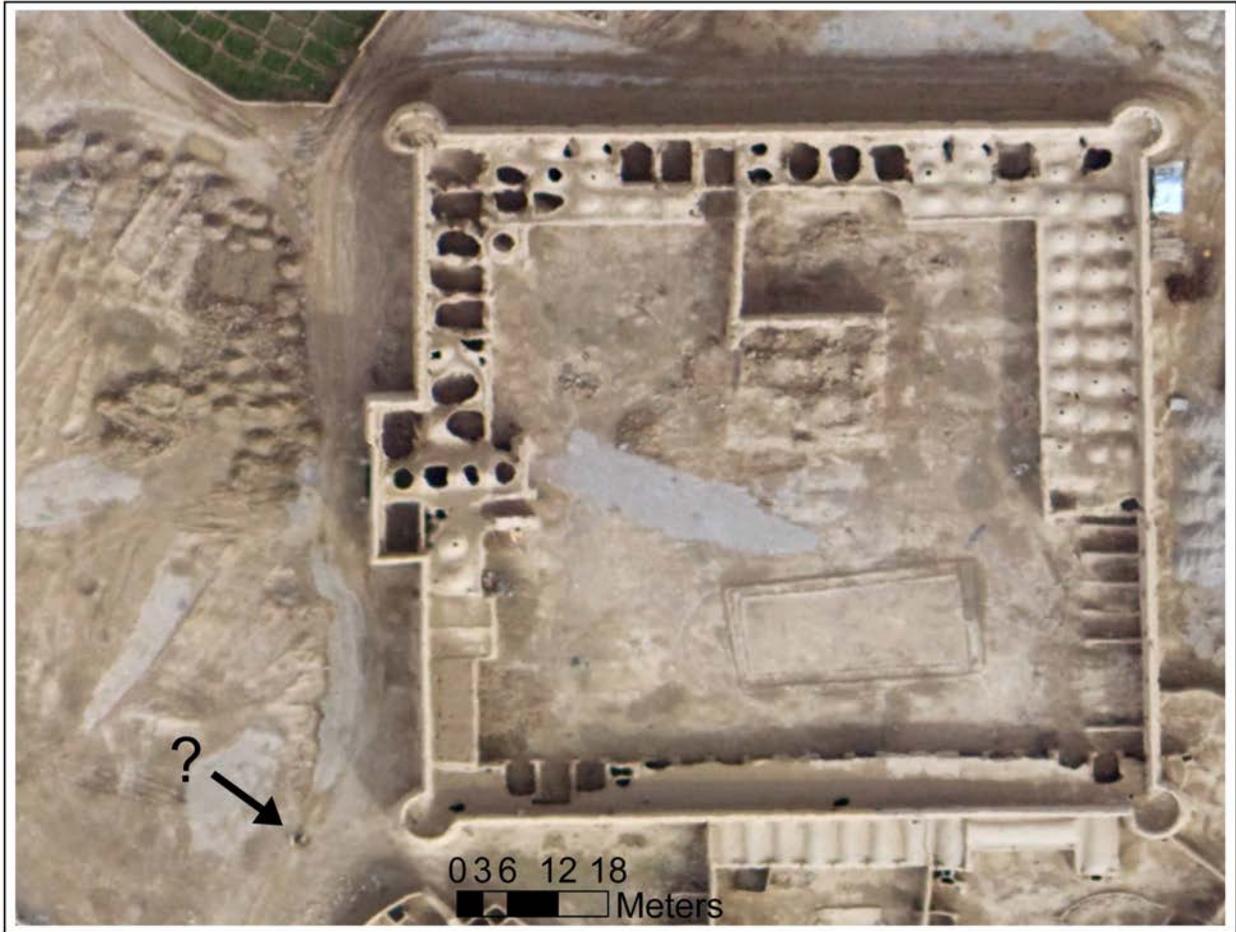
**Figure 40.** Possible covered well with a surface canal; canal does not lead to a residence or field (Feature 29) (imagery courtesy of USAGC, 2008).



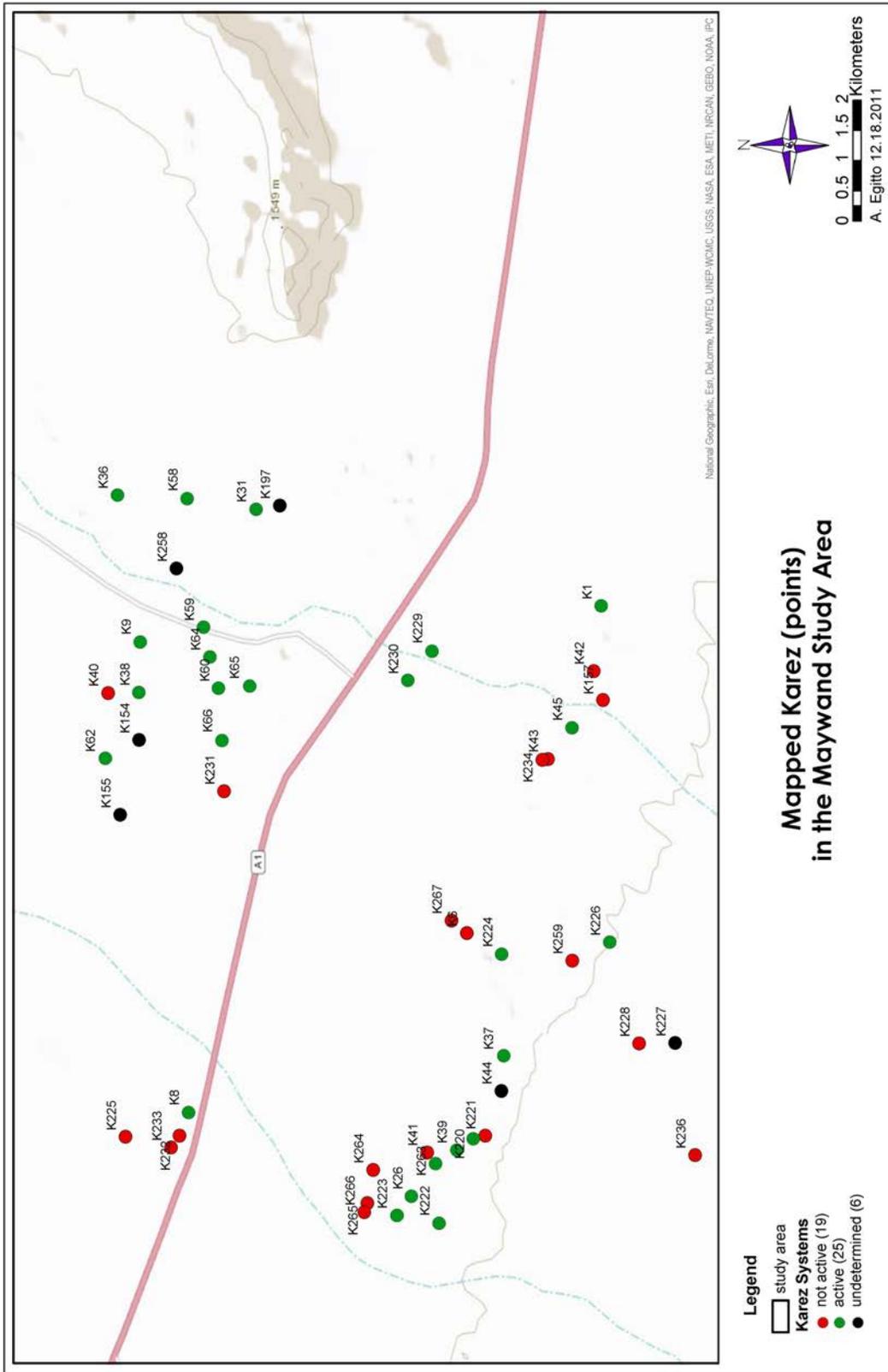
**Figure 41.** Possible covered well with a surface canal; canal leads to a structure (Feature 29) (imagery courtesy of USAGC, 2008).



**Figure 42.** Possible covered well with a small surface canal (Feature 100) (imagery courtesy of USAGC, 2008).

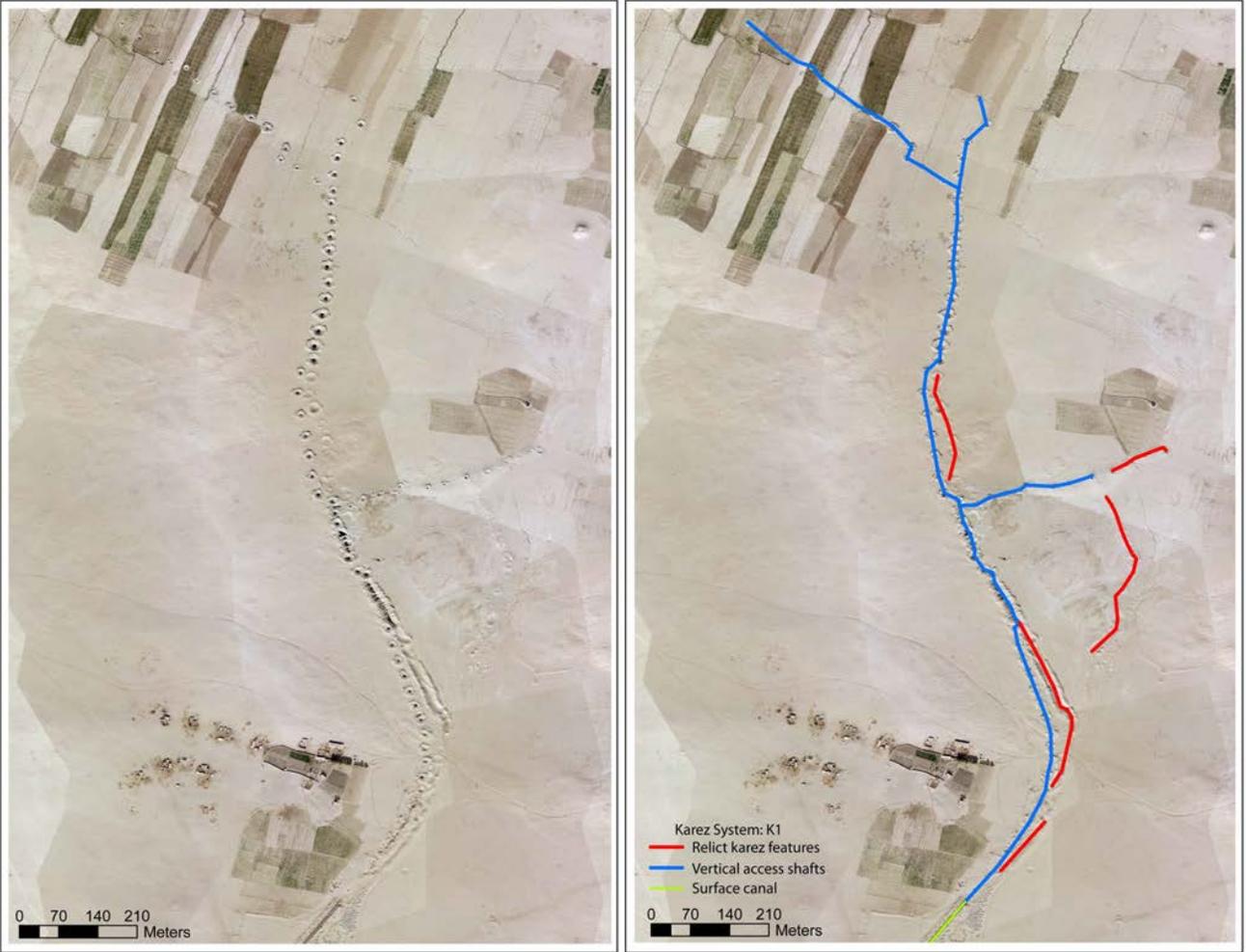


**Figure 43.** An undetermined object or possible well situated outside of the qala walls (Feature 32) (imagery courtesy of USAGC, 2008).



**Figure 44.** The distribution of 50 karez in the study area.





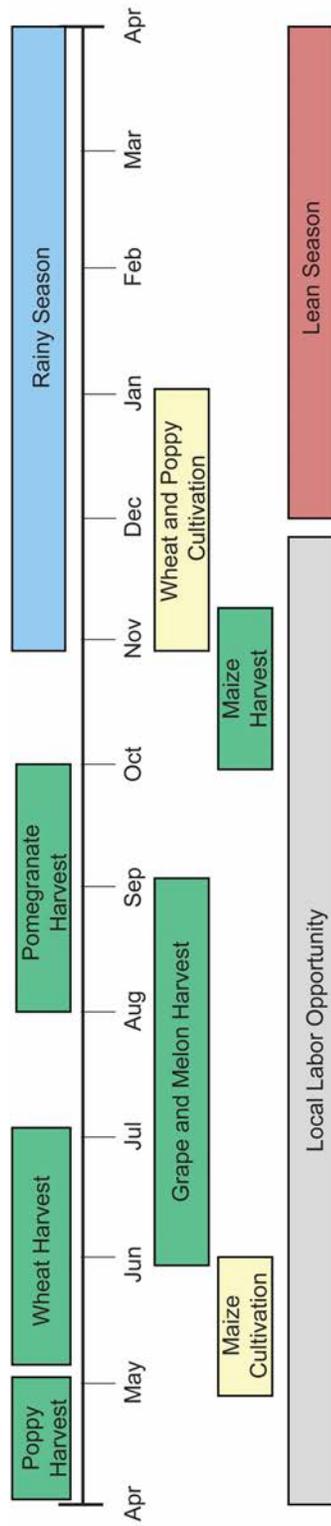
**Figure 46.** Relict and active portions of karez are visible on the landscape surface (imagery courtesy of USAGC, 2008).



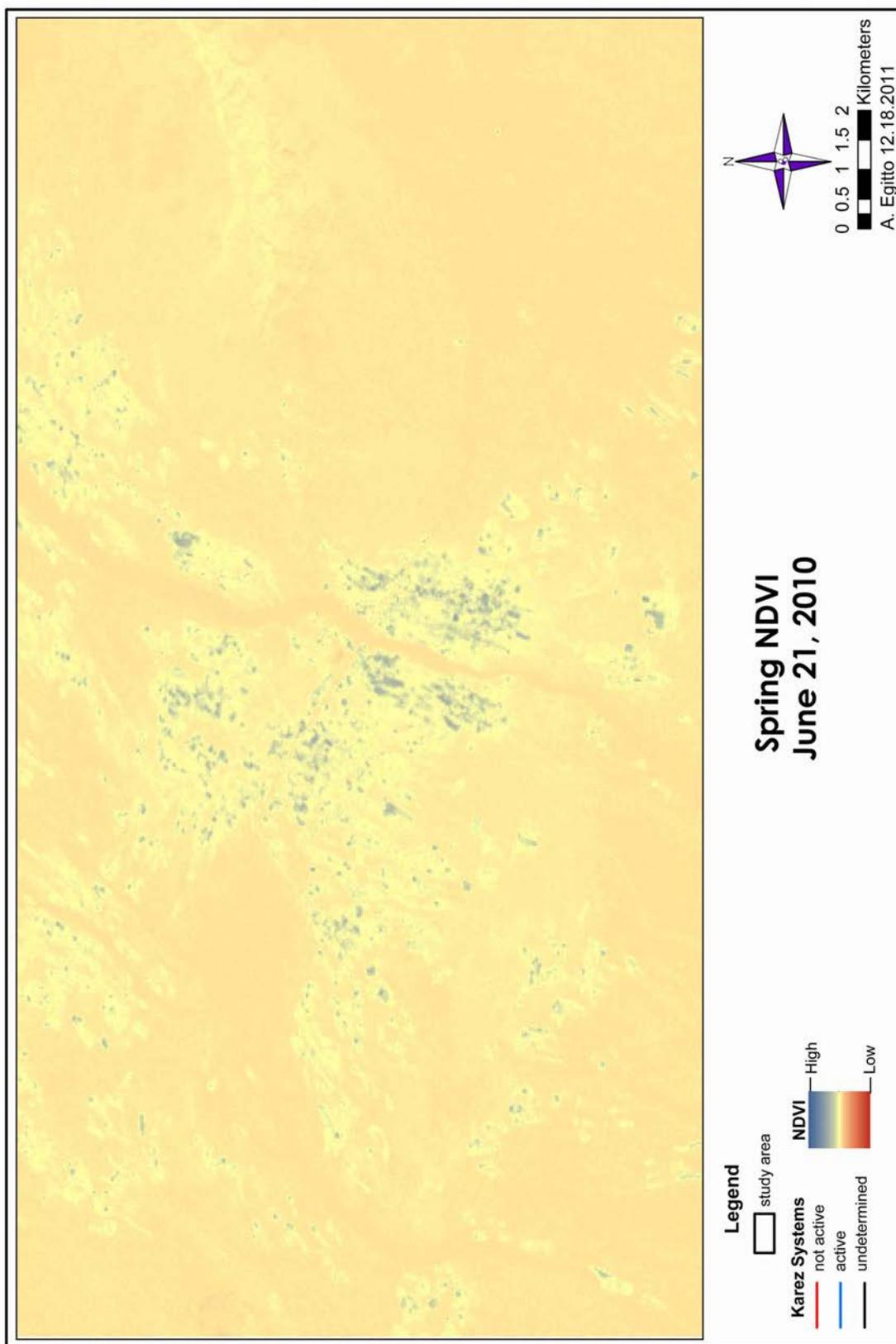
**Figure 47.** Karez surface canals split and weave through household compounds and agricultural fields (imagery courtesy of USAGC, 2008).



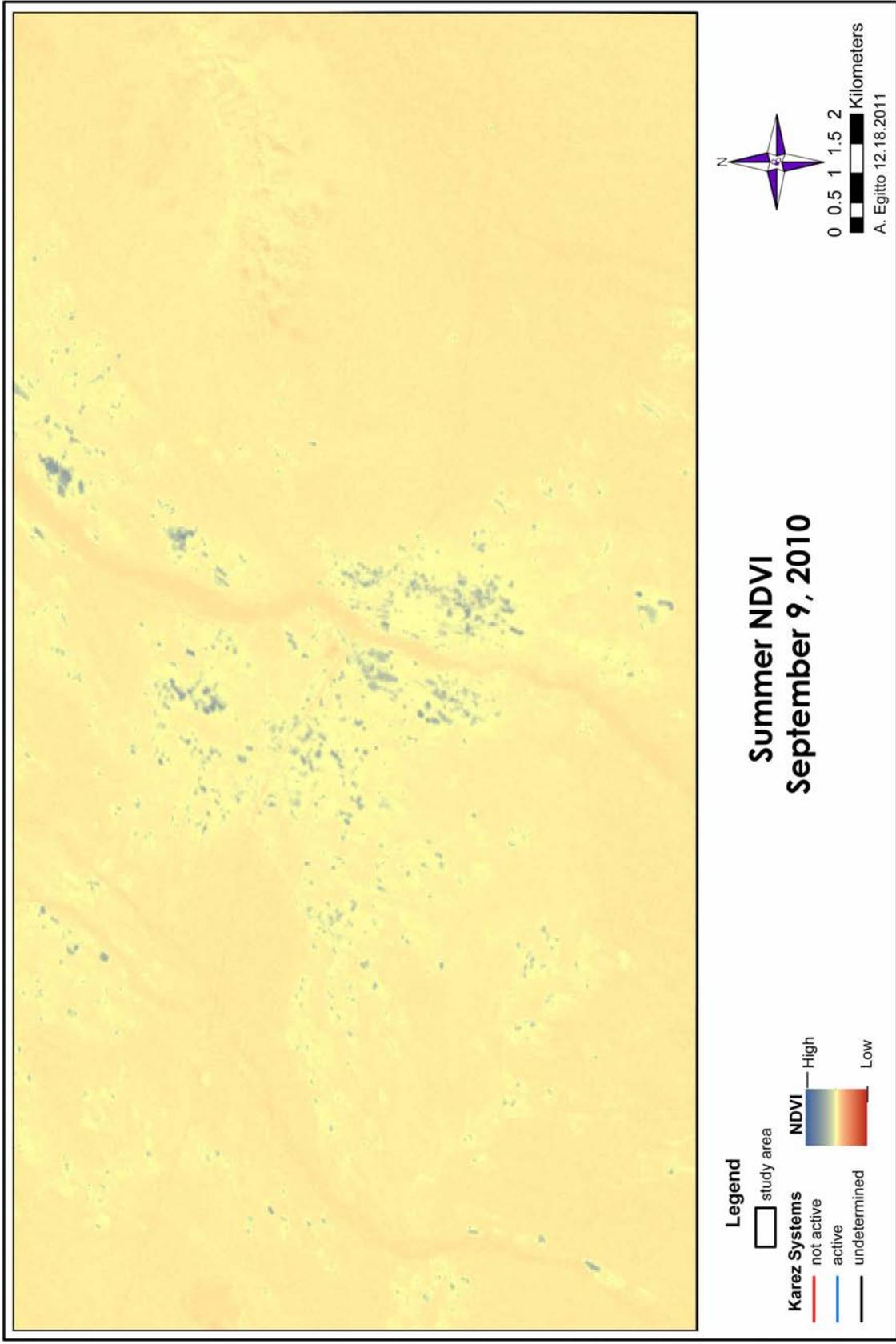
**Figure 48.** Bridges are constructed over karez surface canals in residential areas (imagery courtesy of USAGC, 2008).



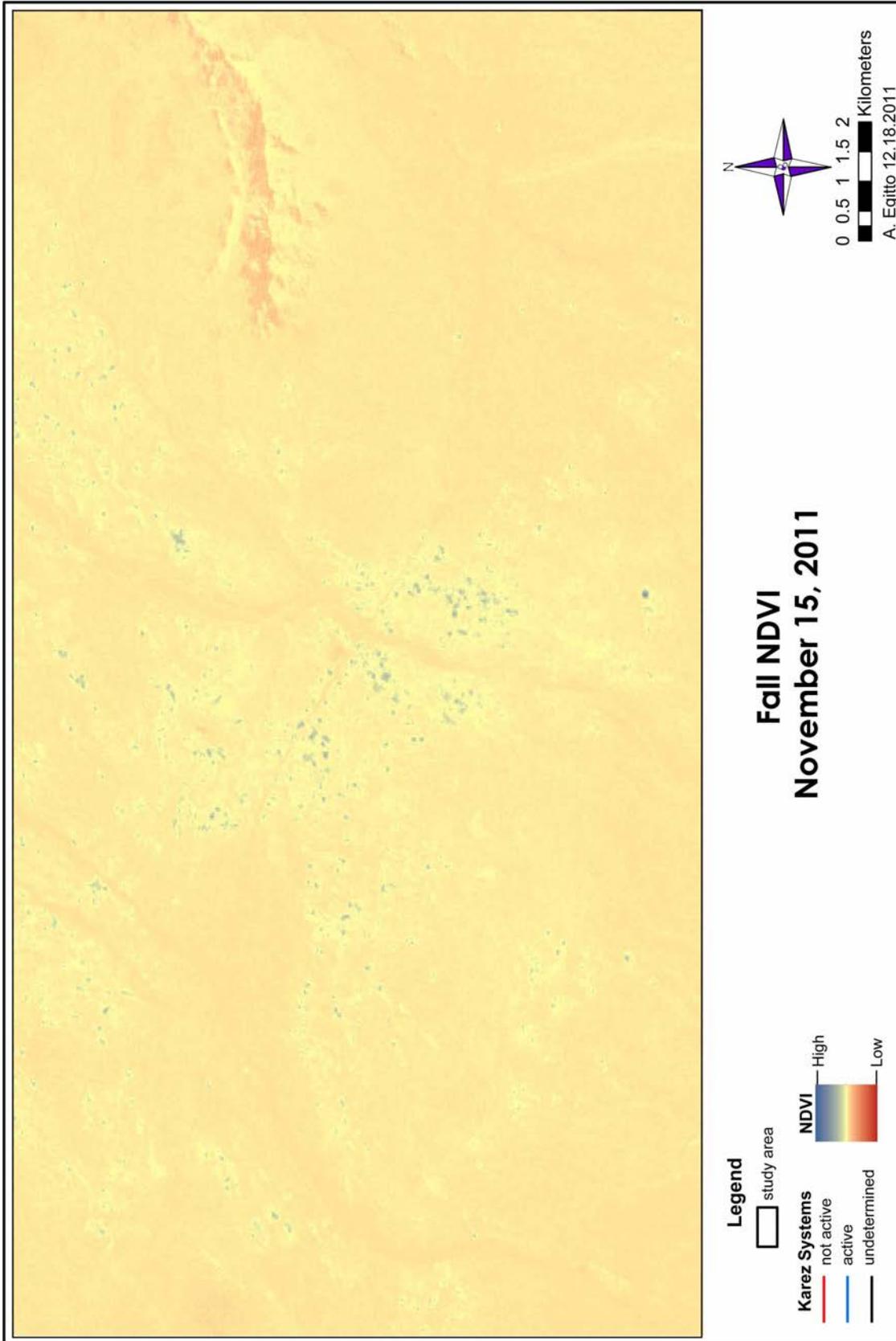
**Figure 49.** Crop calendar for Kandahar Province (redrawn and modified after FEWS NET:2011)



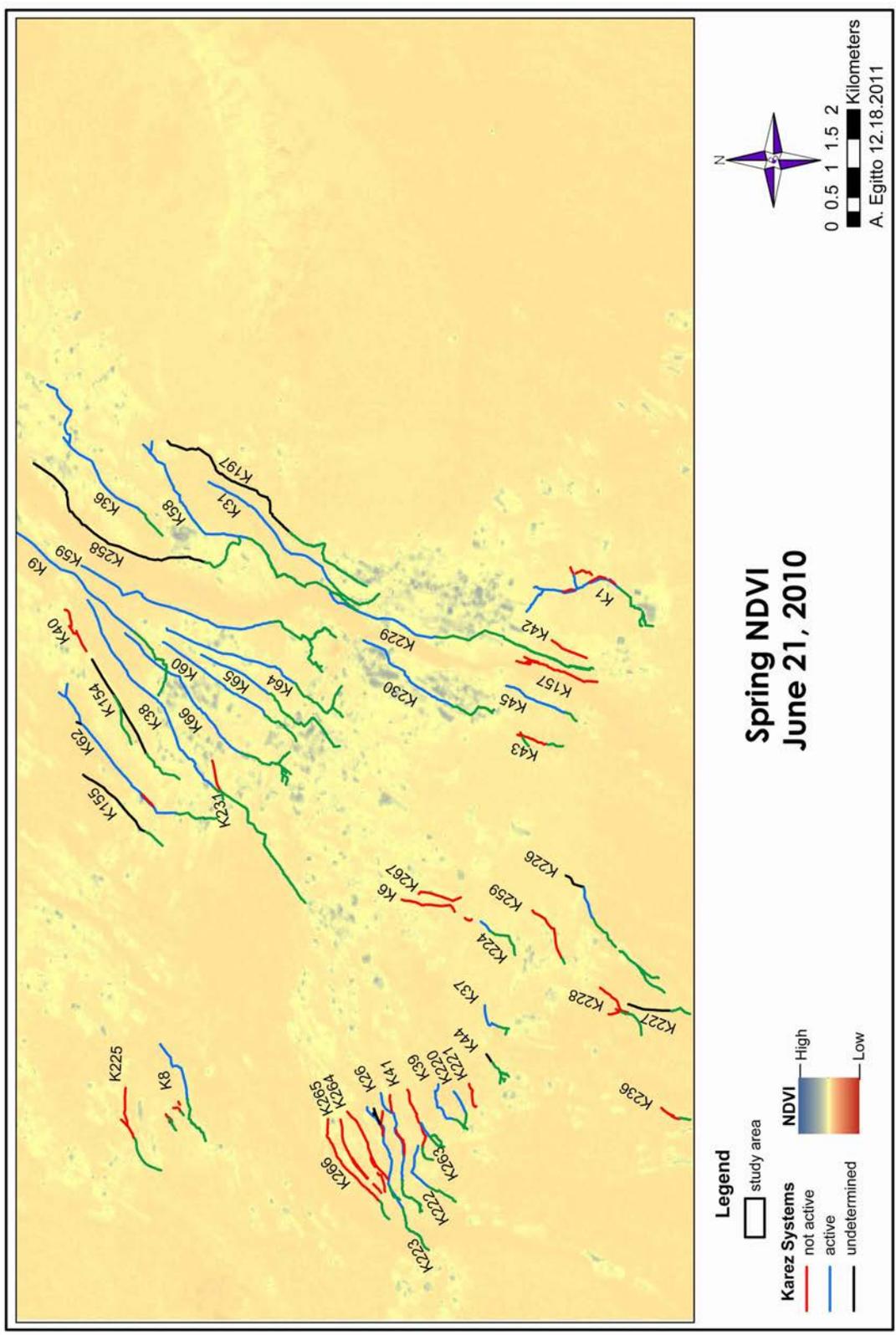
**Figure 50.** NDVI results for spring (June 21, 2010) in the study area.



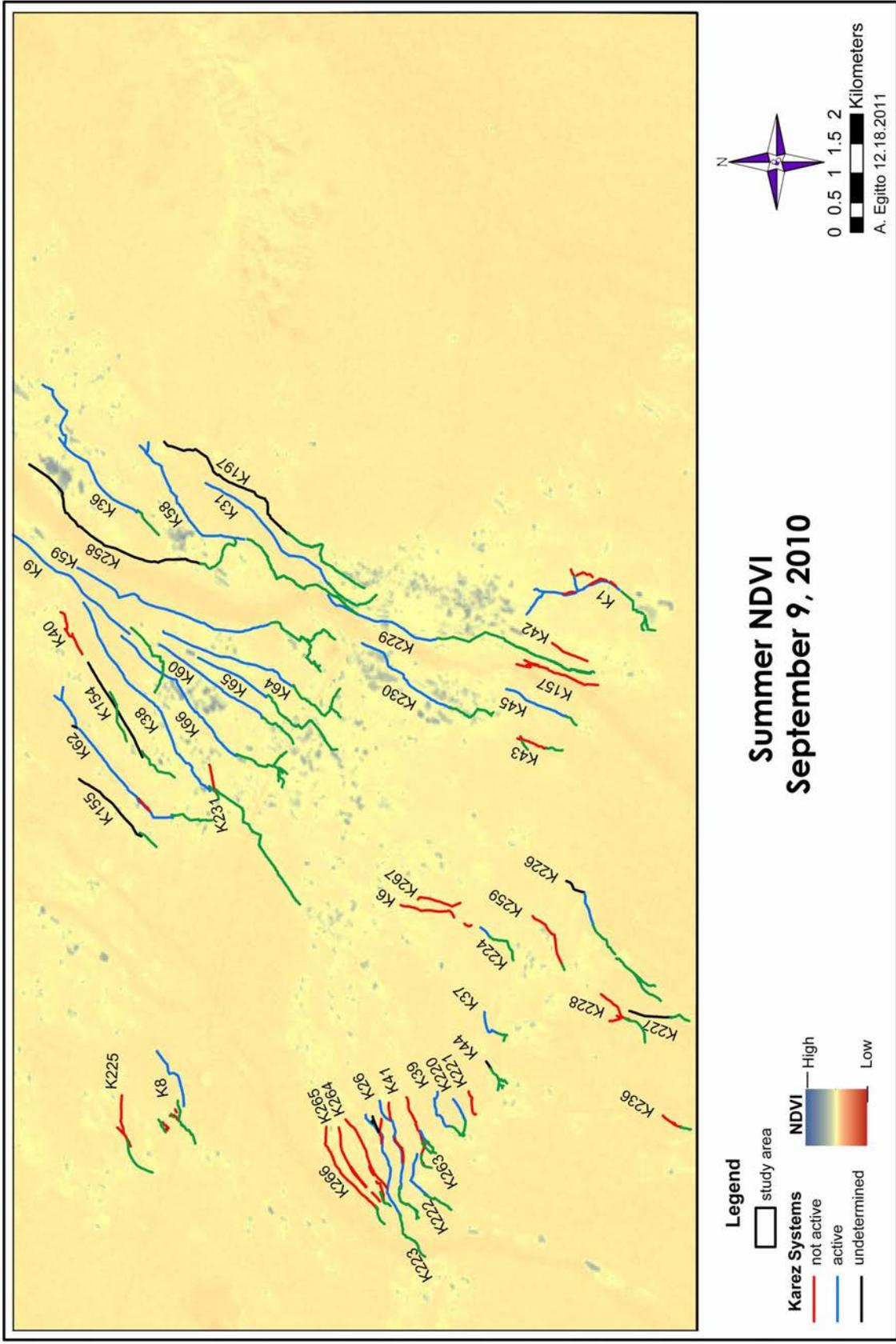
**Figure 51.** NDVI results for summer (September 9, 2010) in the study area.



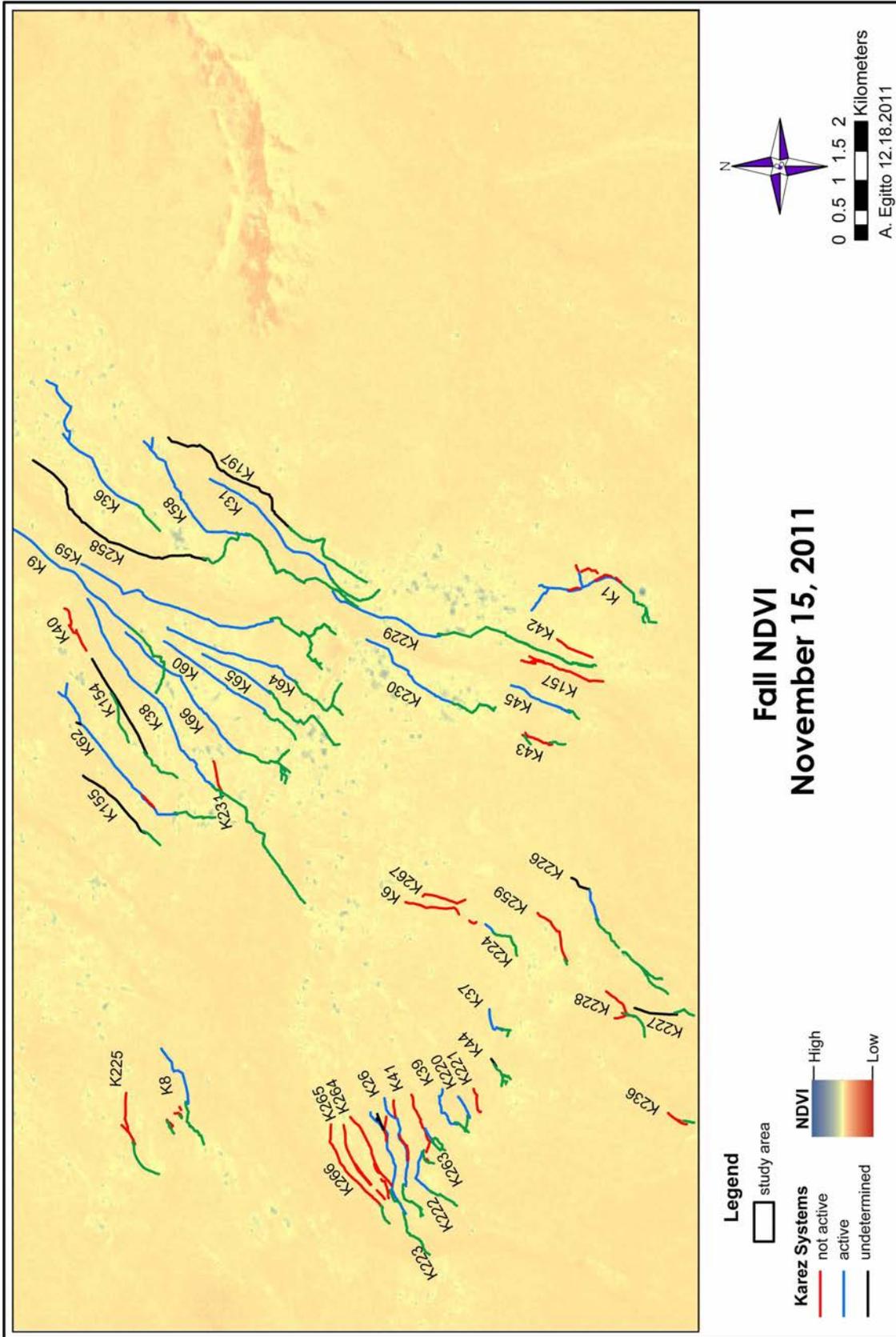
**Figure 52.** NDVI results for fall (November 15, 2011) in the study area.



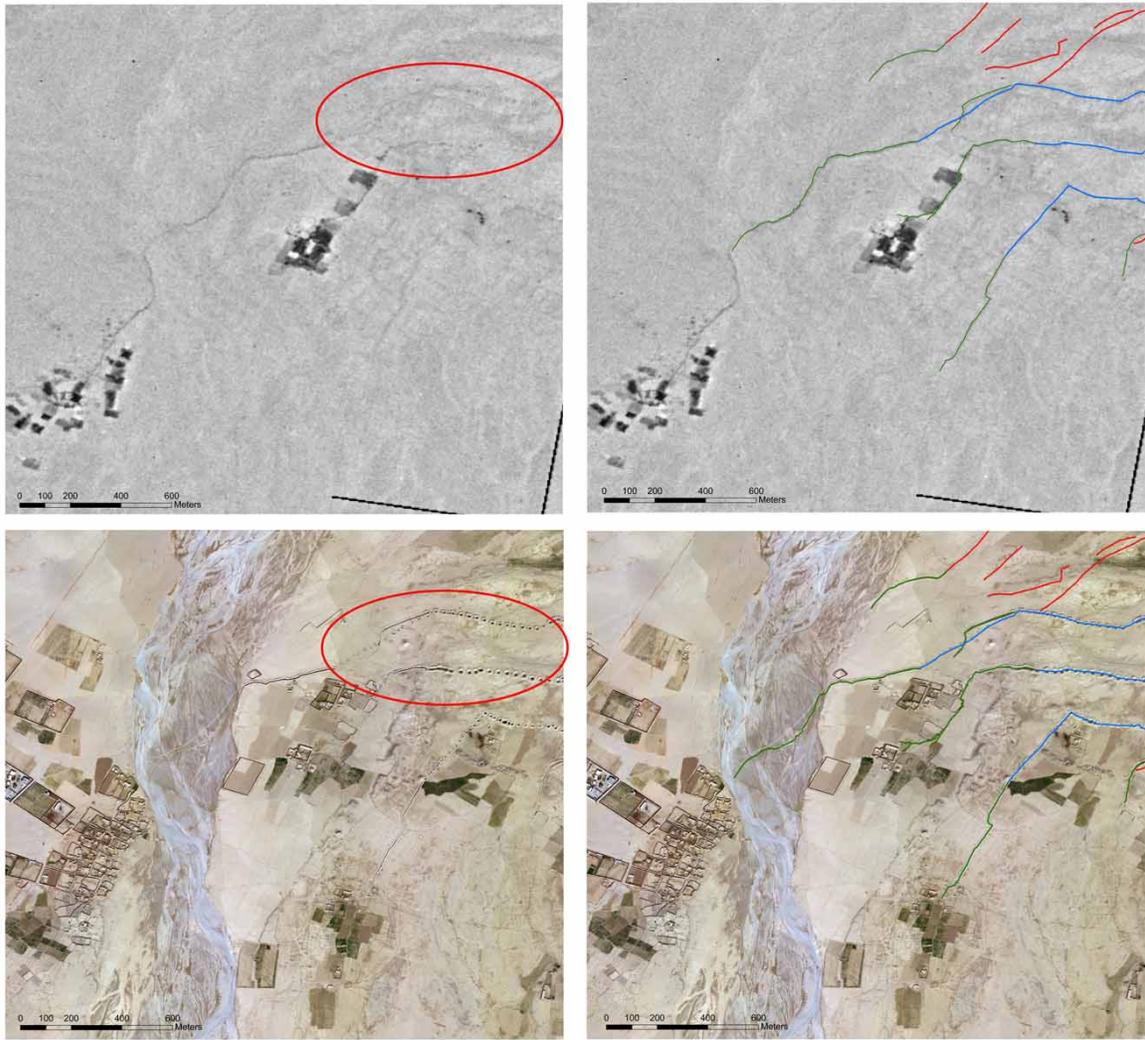
**Figure 53.** Karez in study area overlaid on NDVI results for spring.



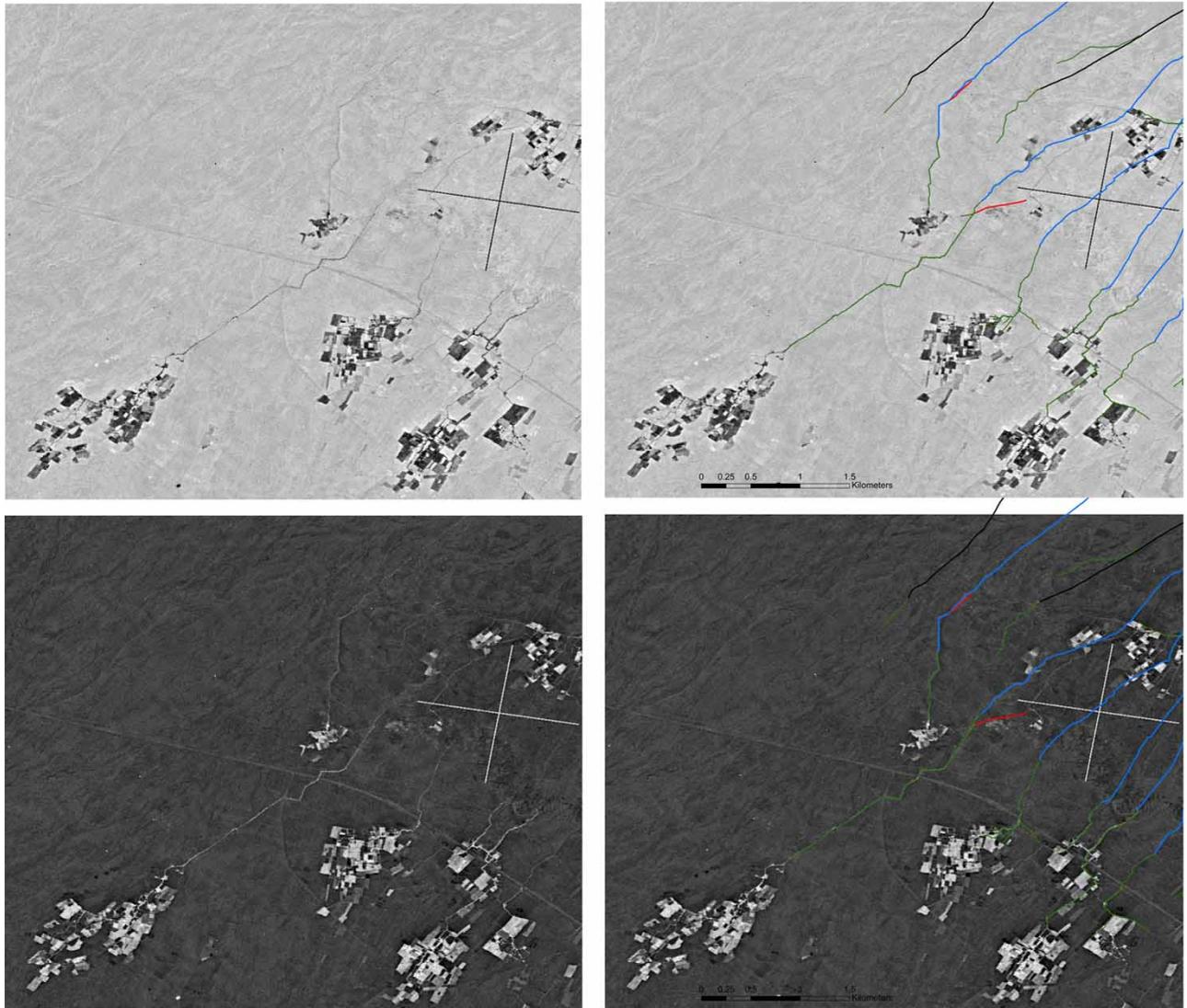
**Figure 54.** Karez in study area overlaid on NDVI results for summer.



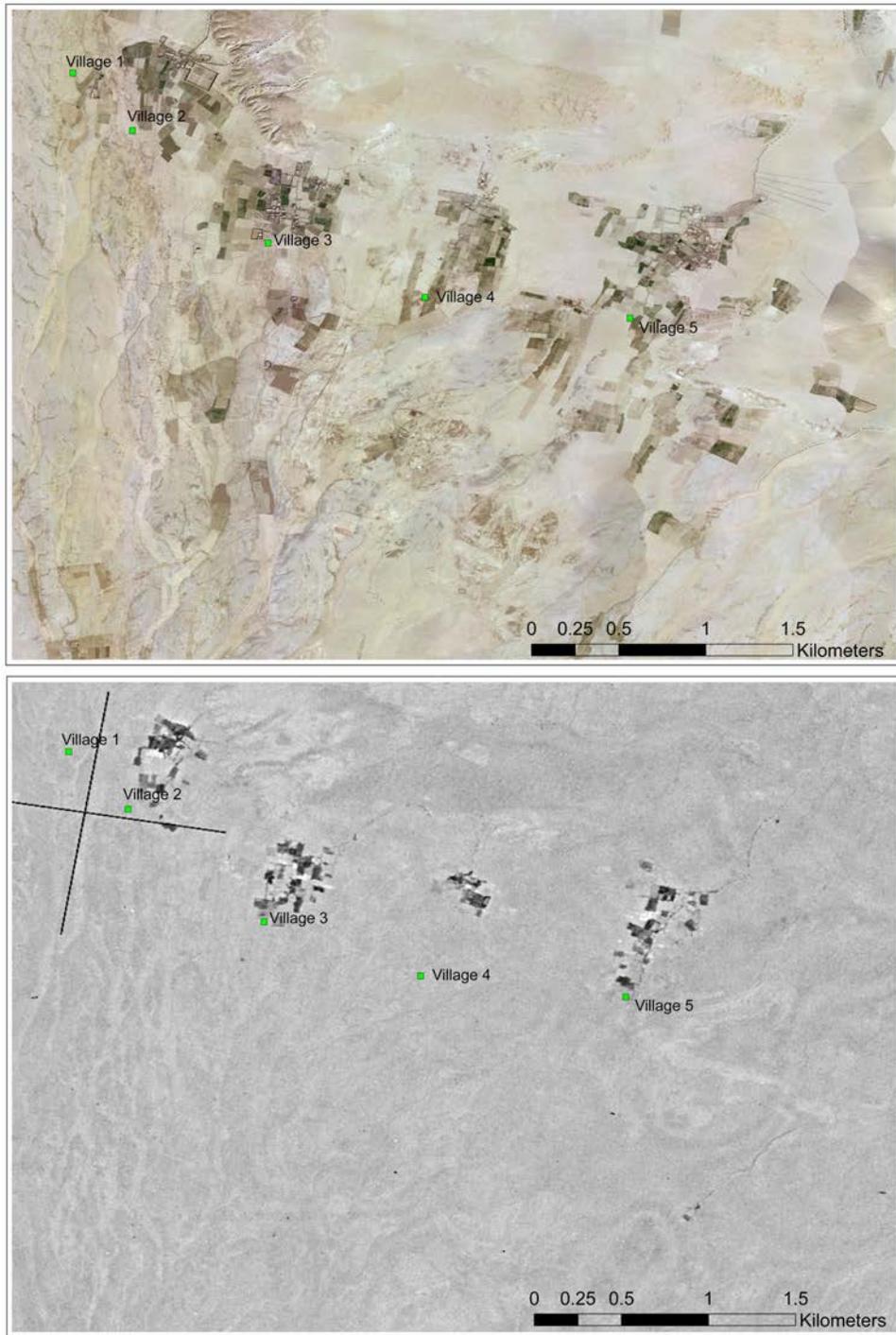
**Figure 55.** Karez in study area overlaid on NDVI results for fall.



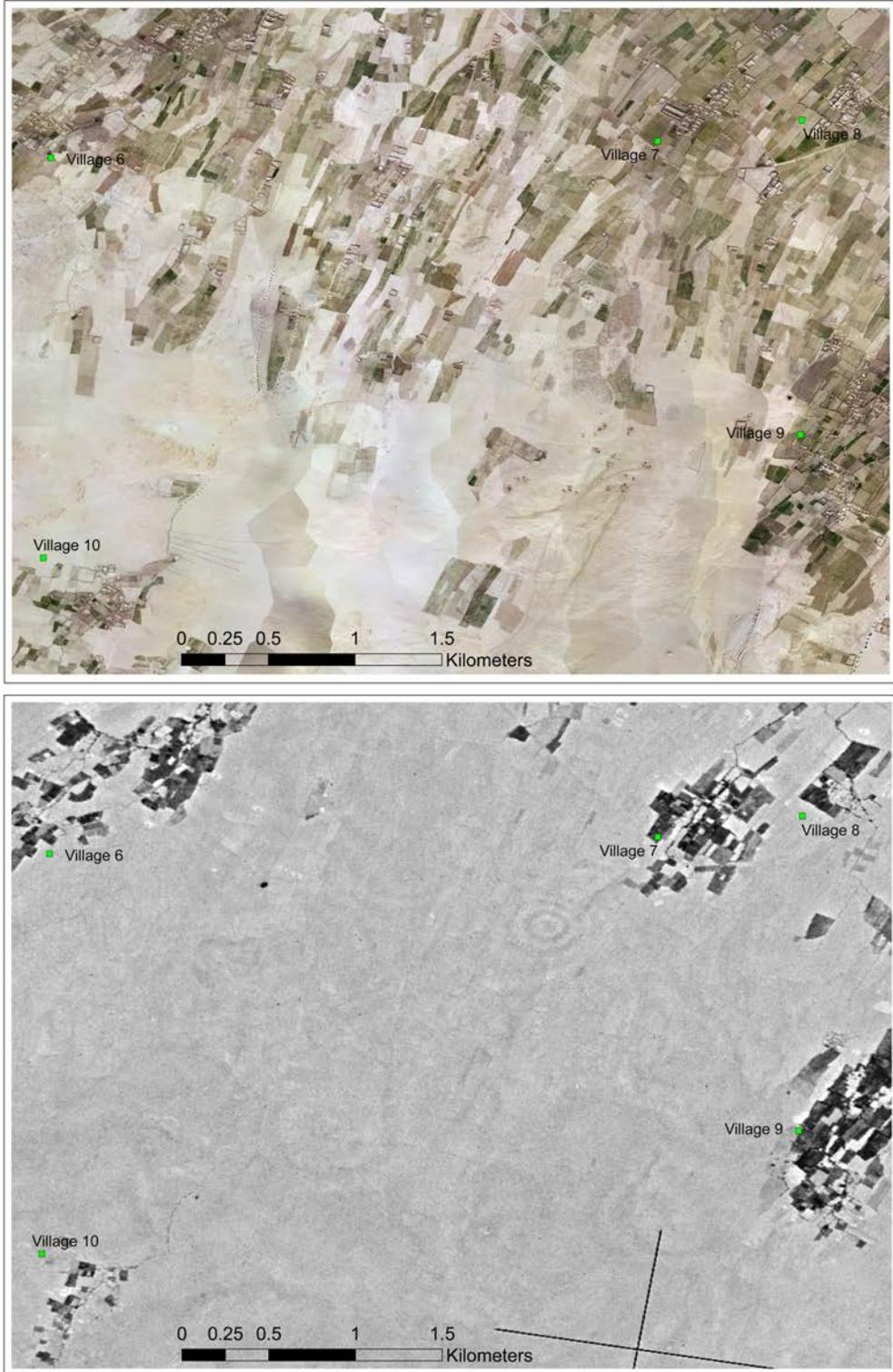
**Figure 56.** Illustrates the difference in resolution in the Corona imagery (top, left) and the orthoimagery (bottom, left). Images on the right illustrate karez movement (imagery courtesy of USAGC, 2008).



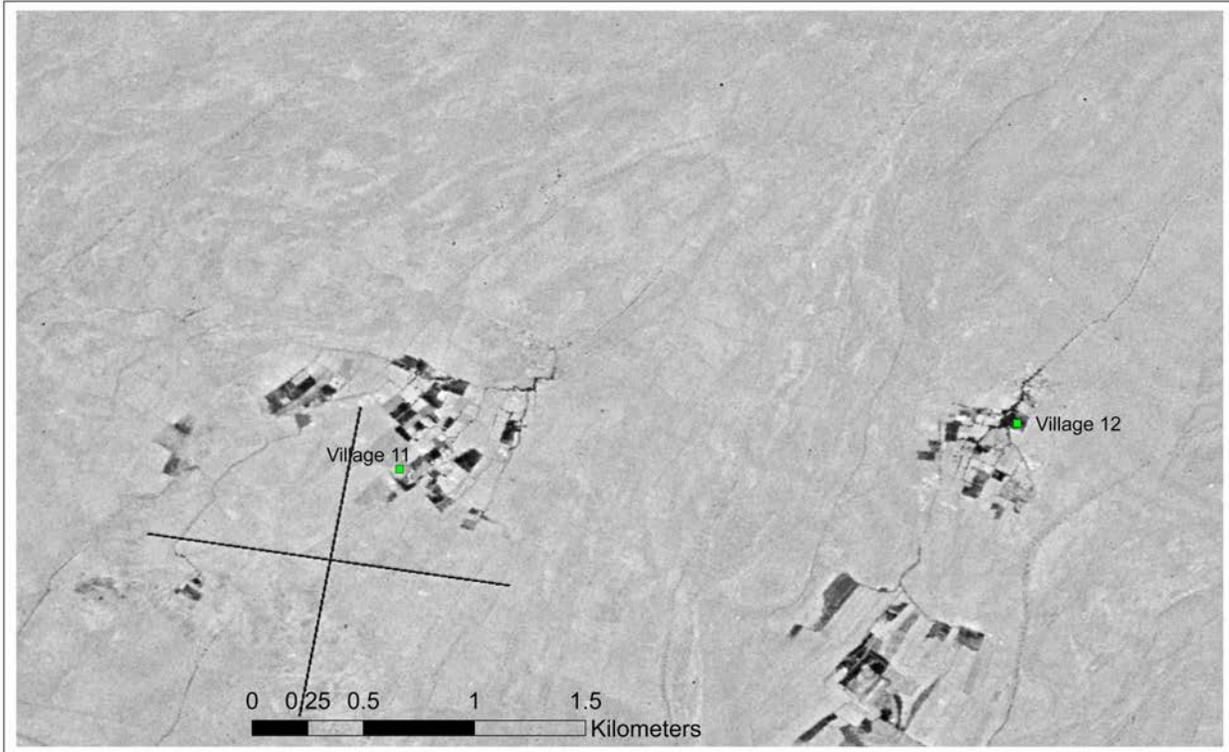
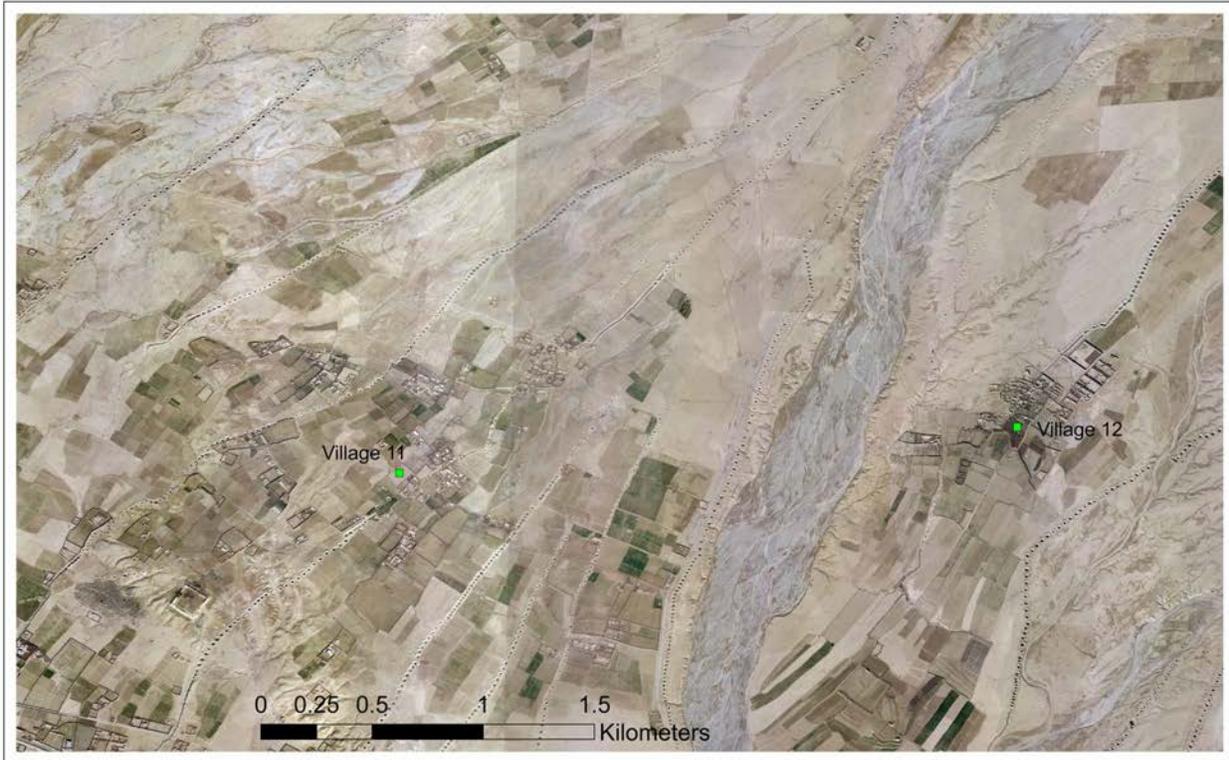
**Figure 57.** Illustrates the difference in karez visibility between the selection of the normal color ramp (top, left) and an inverted color ramp (bottom, left). The right images illustrate karez movement (imagery courtesy of USAGC, 2008).



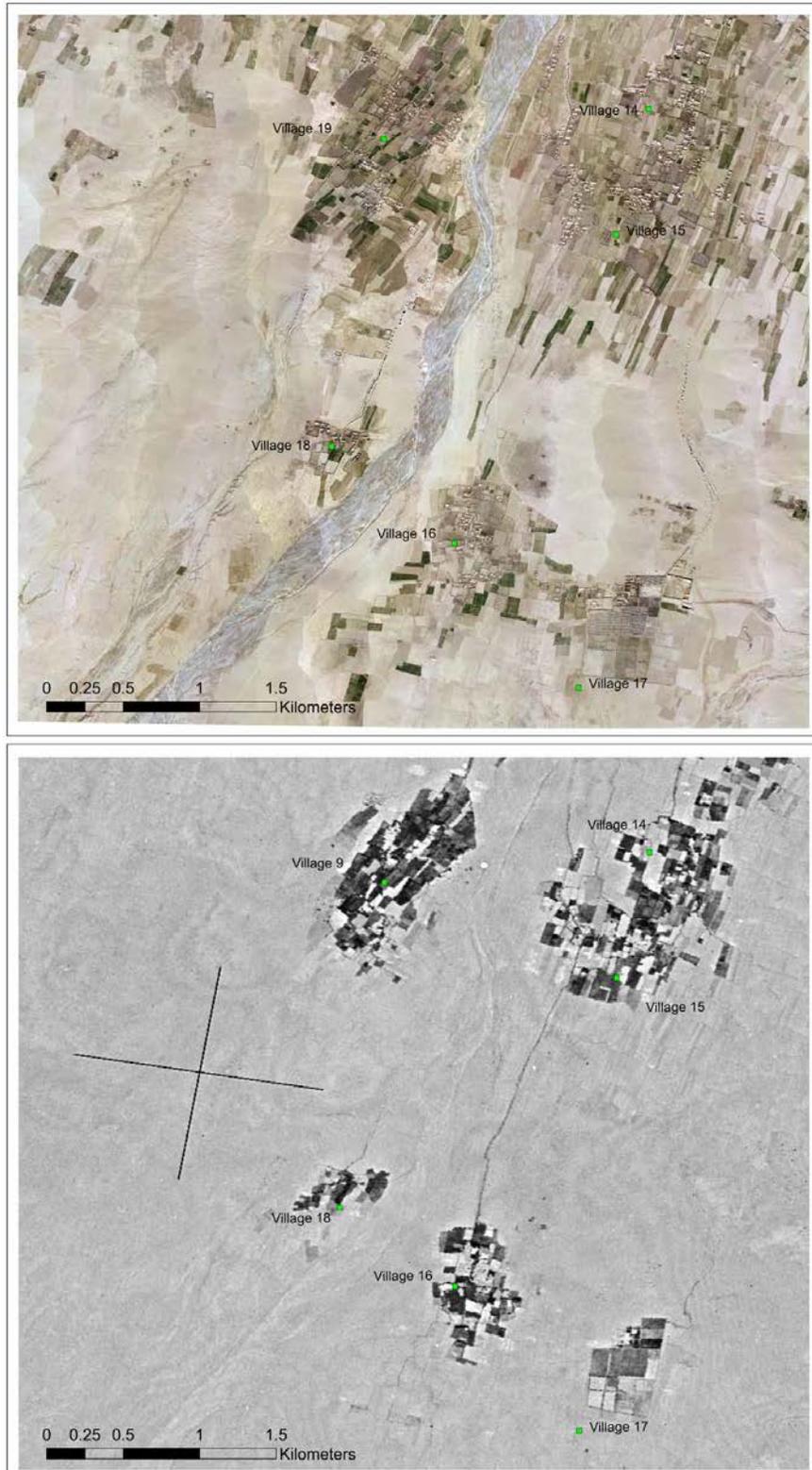
**Figure 58.** Villages 2-4 appear on the landscape as small compact clusters while the orthoimagery (top) shows expansion of both villages and cultivated fields, although there may be fallow fields associated with each of the villages that are not visible in the Corona imagery due to low resolution (imagery courtesy of USAGC, 2008).



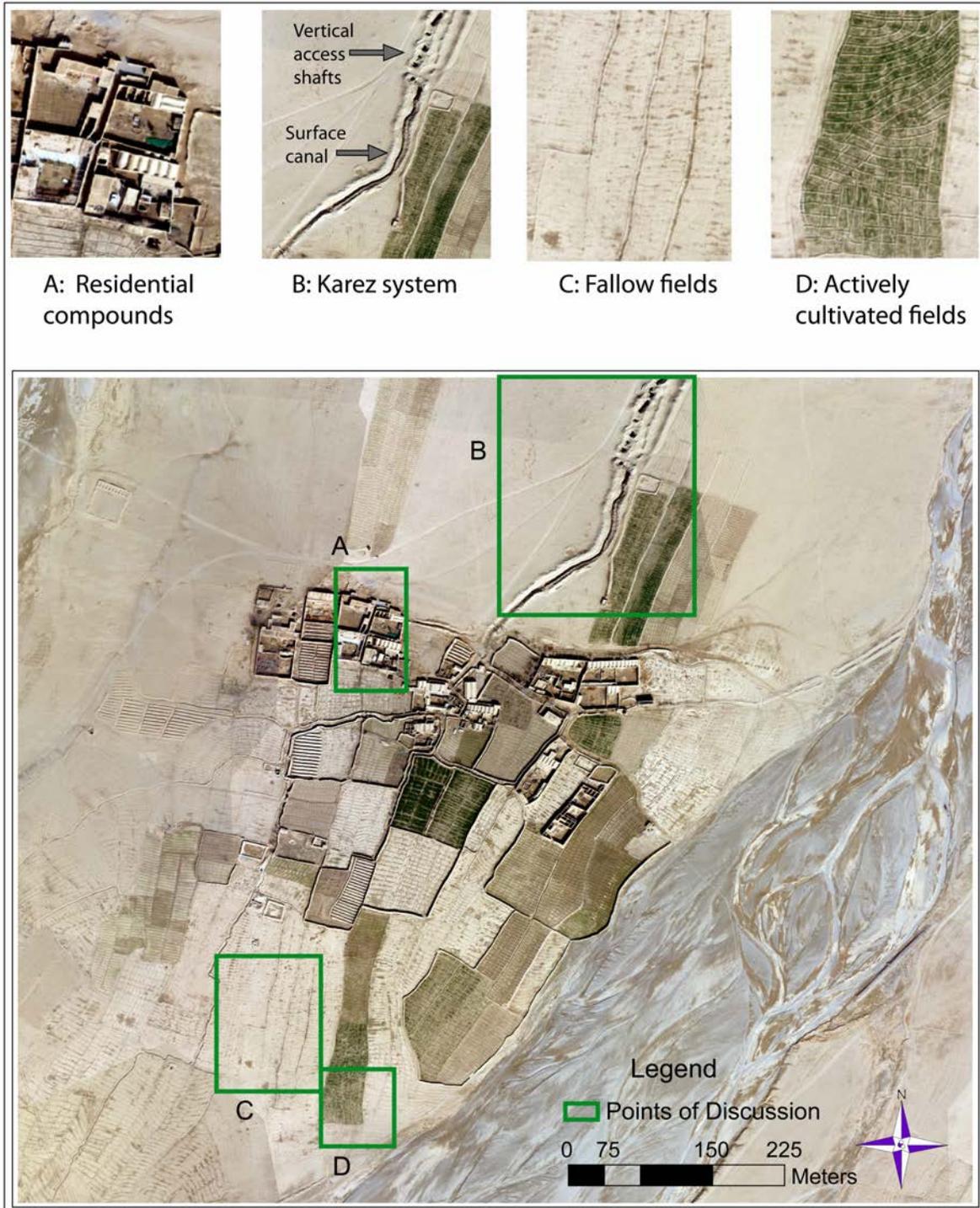
**Figure 59.** A comparison of the 2009 orthoimagery (top, imagery courtesy of USAGC, 2008) with the historic Corona 1980 shows expansion and development occurred from 1980 to 2008



**Figure 60.** Another portion of the study area shows expansion and development occurred from 1980 to 2008 (top, orthoimagery imagery courtesy of USAGC, 2008 with the historic Corona 1980)



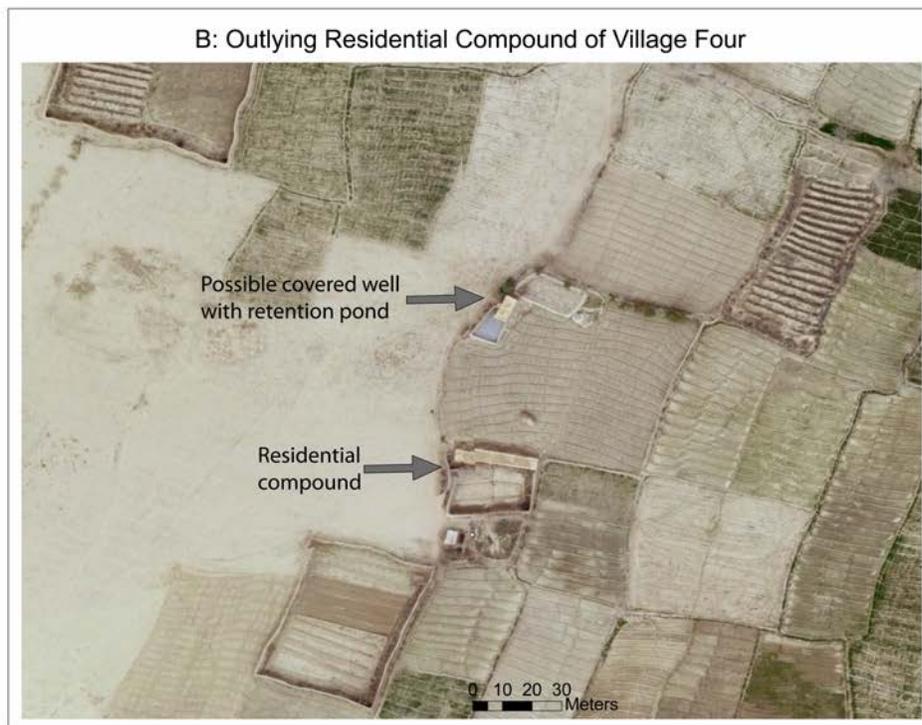
**Figure 61.** Another portion of the study area shows expansion and development occurred from 1980 to 2008 (top, orthoimagery imagery courtesy of USAGC, 2008 with the historic Corona 1980)



**Figure 62.** Components of a village situated within the study area (a) residential compounds, (b) karez system, (c) fallow fields, (d) actively cultivated fields (cemetery and archaeological features not shown) (imagery courtesy of USAGC, 2008).



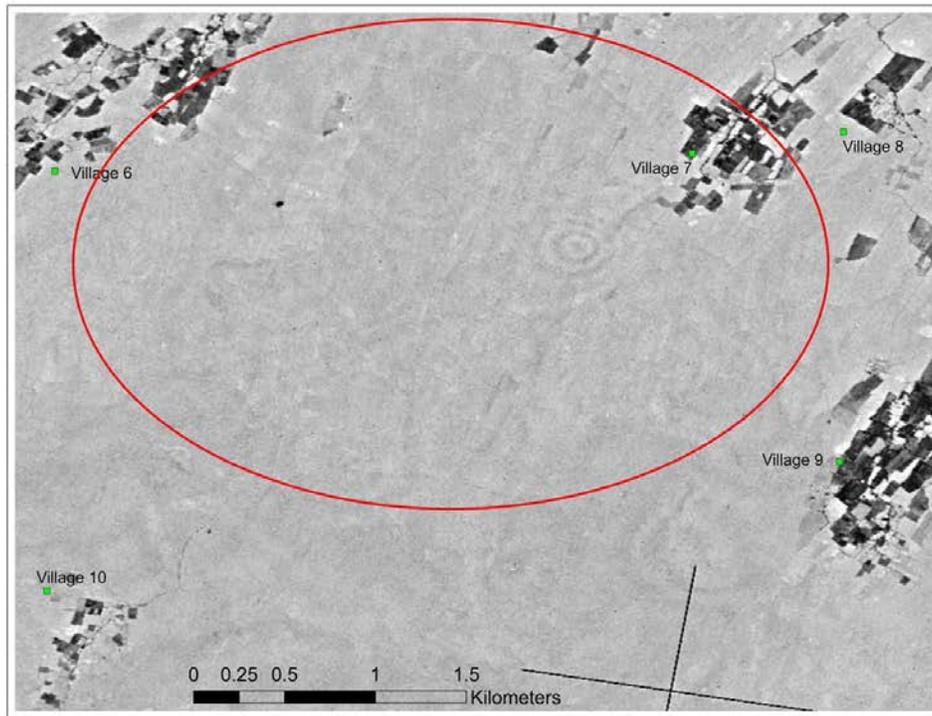
**Figure 63.** Village Four with its village components illustrated: karez system, (A) residential core, and (B) possible outlying residential compound (imagery courtesy of USAGC, 2008).



**Figure 64 a and b.** Zoomed in perspective of the residential core (A) and outlying residential compound with possible covered well (B) of Village Four (imagery courtesy of USAGC, 2008).



**Figure 65.** Water retention pond associated with Village 5 that may be supplied by a water source other than karez K224 (imagery courtesy of USAGC, 2008).



**Figure 66.** There has been an increase in development and agricultural cultivation from 1980 to 2009 but not an increase in karez construction (top, orthoimagery imagery courtesy of USAGC, 2008; bottom, Corona).



**Figure 67.** An example of the Afghan landscape as a palimpsest. The remains of low walls from nomadic or semi-sedentary peoples are situated in close proximity or are buried by a structure of unknown (Feature 36, top and 36a, bottom) (imagery courtesy of USAGC, 2008).



**Figure 68.** Feature 24 illustrates the changing landscape through the reuse of older structures for current uses, in this case, the decision not to remove walls from an older structure and instead, placing agricultural fields in and around the older feature (imagery courtesy of USAGC, 2008).



**Figure 69.** Feature 63 is a mound that probably representing earlier construction and which has been converted into a cemetery (imagery courtesy of USAGC, 2008).



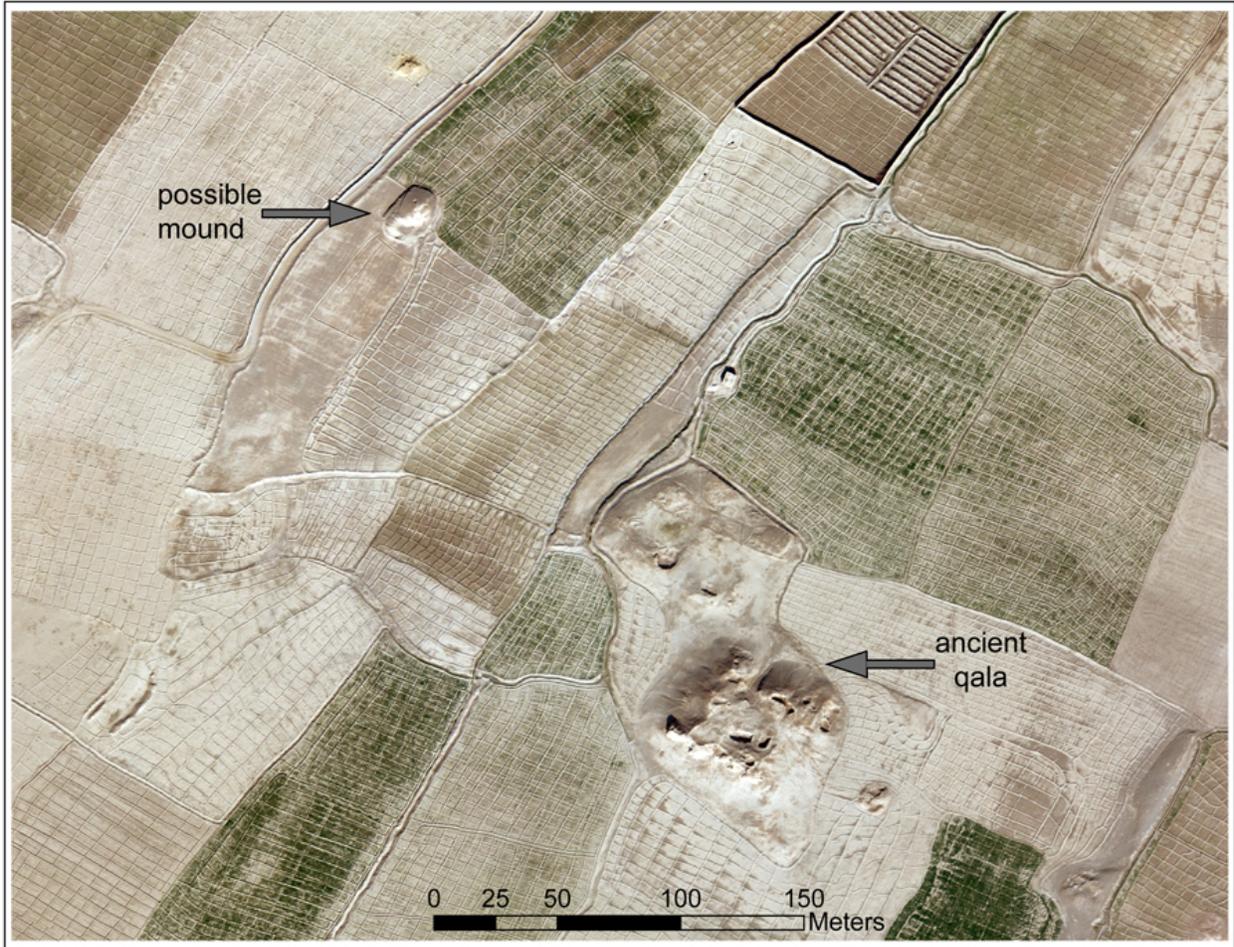
**Figure 70.** Karez run in close proximity to cultural property (imagery courtesy of USAGC, 2008).



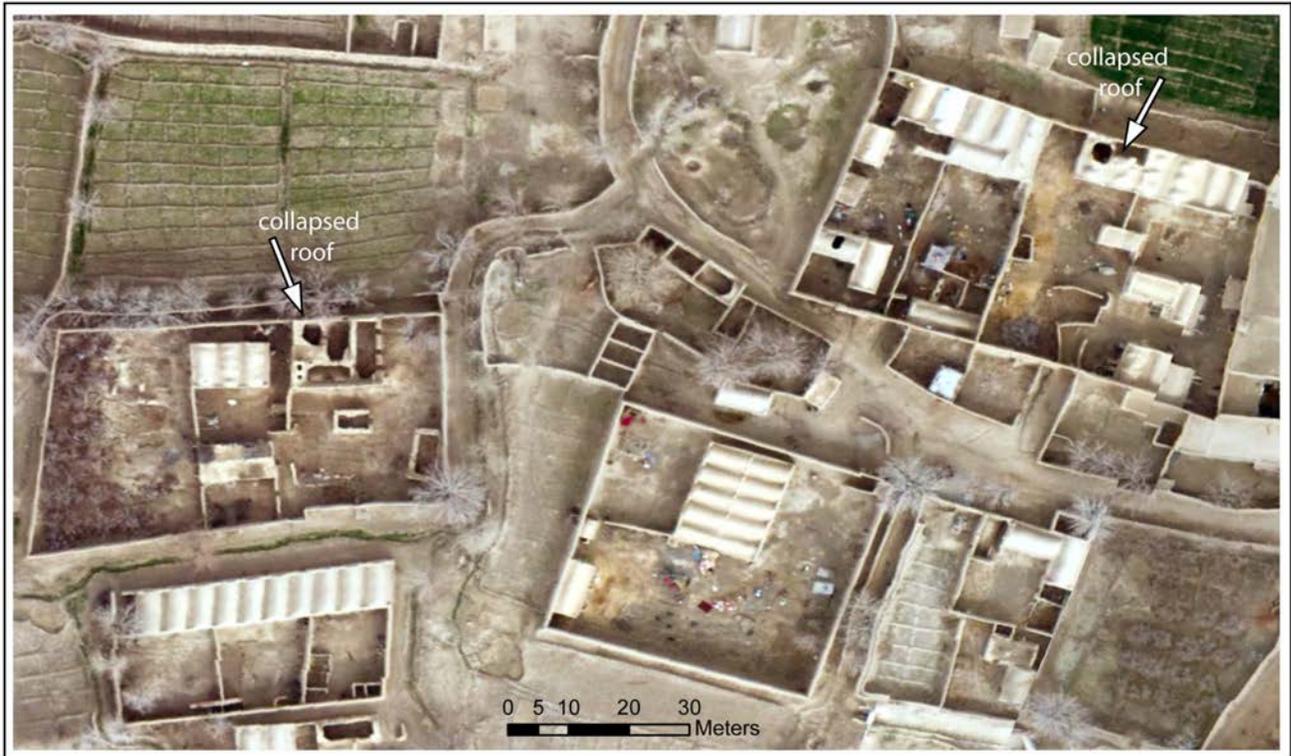
**Figure 71.** The Soviet Union both destroyed and created items of cultural heritage. Russian tanks rusting on the landscape contribute to the palimpsest that is the Afghan landscape (Photo by Ken Scar, downloaded from DVIDS at <http://www.dvidshub.net>)



**Figure 72.** The empty niches of the Bamiyan Buddhas are examples of a landscape of conflict and both an ethnoscape and archaeoscape. (Photo by Ken Scar, downloaded from DVIDS at <http://www.dvidshub.net>)



**Figure 73.** The avoidance of features on the landscape may represent the effects of memory and the valuation of ancient features or may represent the need to utilize every possible meter or arable land. Further, this image demonstrates that these features are noticeable in the orthorectified imagery since the agricultural fields avoid them (imagery courtesy of USAGC, 2008).



**Figure 74.** The household compound with its mud-brick walls represents and creates social order while Pashtunwali represents identity but reinforces it through gendered spaces. Within the household compound, there are spaces that are defined specifically by gender and women are generally restricted to activities that can be carried out within the confine of the household compound (imagery courtesy of USAGC, 2008).



**Figure 75.** Demonstrates the continued use of structures as seen through the evolution of the qala (Feature 29, top; Feature 32 bottom) (imagery courtesy of USAGC, 2008).



**Figure 76.** Demonstrates the continued architectural style of the qala (Feature 100) (imagery courtesy of USAGC, 2008).



**Figure 77.** Demonstrates the continuation of architectural elements of the qala (Feature 63) (imagery courtesy of USAGC, 2008).

## **XI. APPENDICES**

Three appendices present detailed data created through researching and mapping karezes and archaeological resources in the study area. These are:

**Appendix A** - Glossary of Relevant Terms

**Appendix B** – Catalog of Karezes in Maywand District

**Appendix C** - Archaeological Gazetteer of Maywand District

## Appendix A: Glossary of Relevant Terms

<b>arbab</b>	village overseers acting for the larger absentee landlord (Dupree 1973: 151)
<b>badal</b>	a theme or principle of Pashtunwali that translates as “revenge” (Goodson 2001:15-16; Hawkins 2009: 17; Kakar n.d.: 3-6)
<b>caravanseri</b>	shelter or hostel on a trade route (Knobloch 2002: 57, 169)
<b>chah</b>	vertical access shafts that are dug in the construction of the karez tunnel and which are used for maintaining the karez
<b>ghayrat</b>	a theme or principle of Pashtunwali that translates as “bravery” (also “ <i>nang</i> ”) (Goodson 2001-16; Hawkins 2009: 17; Kakar n.d.: 3-6)
<b>ghusl</b>	bathing (Faruqui 2001: 1)
<b>haq al shafa</b>	two laws on the use of water rights. The first use of water rights is “the law of thirst or the right of humans to drink or quench their thirst”—also referred to as “ <i>shirb</i> .” The second use of water rights is for domestic animals and refers to “the right of cattle and household animals” (Faruqui 2001: 2, 23)
<b>hashar</b>	is the labor or in-kind contributions by farmers for irrigation maintenance and is determined based on the area under cultivation by each farmer and depends on the amount of shab-roz a farmer receives. Overseeing hashar is the responsibility of the mirab (Roe 2008:42). In the village of Zandra, in the District of Ziarat, Baluchistan Province, Pakistan, hashar is called “wragom.” The shareholder could perform the work himself, pay someone to work in his place, or pay money (called <i>nagha</i> , locally). Mirabs use this money to hire maintenance labor (Mohyuddin, et al. 2012b: 131, 136)
<b>imandari</b>	a theme or principle of Pashtunwali that translates as “righteousness” (Dupree 1973: 126; Goodson 2001: 15-16)
<b>iwan</b>	“a great vaulted space open to the court and wholly or partially closed on three sides.” Its use begins in during the Early Islamic Period and continues into the Timurid Period (Knobloch 2002:50)
<b>jerib</b>	unit of land measurement; one jerib is roughly one-fifth of a hectare (Pain 2010: vi; Pain and Kantor 2010)

<b>'isteqamat</b>	a theme or principle of Pashtunwali that translates as “persistence; constancy” (Dupree 1973: 126; Goodson 2001: 15-16)
<b>jirga</b>	one of the institutions of Pashtunwali which Barth (1969: 120) defines as “councils, and the honourable pursuit of public affairs.”
<b>karez</b>	a traditional system of water management in arid regions that taps into the water table using tunnels that make use of freatic pressure in alluvium to collect and transport water. These systems move water through both subsurface tunnels and surface canals to serve settlements and irrigate agricultural fields (Lightfoot 2009; Roe 2008; Rout 2008). Also referred to as <i>kārīz</i> or <i>kārēz</i> in Iran, Afghanistan, and Pakistan; <i>qanāt</i> in Iran, Syria and Jordan; <i>kahan</i> or <i>khettara</i> in Morocco; <i>galeria</i> in Spain; <i>falaj</i> in United Arab Emirates and Oman; <i>kahn</i> in Baloch; and <i>foggara</i> or <i>fughara</i> in North Africa.
<b>karezkan</b>	a specialist that constructs and maintains karez (Rout 2008)
<b>khan</b>	a wealthy landowner or the master of the qala (Hallet and Samizay 1980: 127; Pain and Kantor 2010: vii)
<b>khel</b>	a Pashtun tribal division (Roe 2008)
<b>kodai</b>	ovate-oblong huts used by Pashtuns that are semi-sedentary pastoralists and traders. Construction begins with a low (ca. 30 cm) ovate-oblong clay wall. A frame is constructed using two center poles and a ridgepole and then 24 poles are inserted into the low clay wall and tied to the ridgepole. Walls are constructed from bundles of straw tied to the frame. When the structure is abandoned, only the center poles and ridgepoles are taken for reuse (Szabo and Barfield 1991: 99-101)
<b>kodik</b>	ovate-oblong huts used by the Baluch, Pashtuns, and Brahuis along the Helmand River in southeastern Afghanistan . These are constructed of tamarisk. A low (ca. 25 cm) wall is built along the inside wall to keep out insects and snakes (Szabo and Barfield 1991: 103)
<b>malik</b>	1. traditional village elder (Pain 2010; Pain and Kantor 2010) 2. resident lieutenants referred to as “headmen” that oversees and collects rent from villages for larger absentee landowners (Dupree 1973: 151)
<b>madrassa</b>	a school or place of learning (Dupree 1973:318)
<b>mehrmopalineh</b>	a theme or principle of Pashtunwali that translates as “hospitality” (Goodson 2001:16; Hawkins 2009: 17; Kakar n.d.: 3-6) and refers to refers to “hospitality to guests” (Dupree 1973: 126)

<b>melmastia</b>	1. a theme or principle of Pashtunwali that translates as “hospitality” (Goodson 2001: 16; Hawkins 2009: 17; Kakar n.d.: 3-6) and refers to “being a genial host” or “giving lavish parties” (Dupree 1973: 126) 2. also presented as one of the institutions of Pashtunwali which Barth (1969: 120) defines as “hospitality, and the honourable uses of material goods.”
<b>mirab</b>	a water bailiff (Roe 2008)
<b>musalla</b>	a place of worship (Dupree 1973:318)
<b>namus</b>	a theme or principle of Pashtunwali that translates as “honor” (Goodson 2001:16; Hawkins 2009: 17; Kakar n.d.: 3-6)
<b>nanawati</b>	a theme or principle of Pashtunwali that translates as “a right to asylum” (Dupree 1973: 126). The literal translation of <i>nanawati</i> is “to enter into the security of a house” (Kakar n.d.: 4)
<b>nang</b>	a theme or principle of Pashtunwali that translates as “bravery” (also “ <i>ghayrat</i> ”) (Goodson 2001: 16; Hawkins 2009: 17; Kakar n.d.: 3-6)
<b>pakhsa</b>	mud bricks. Pakhsa are used to construct the tall walls of qalas (Hallet and Samizay 1980: 129; Szabo and Barfield 1991: 137)
<b>Pashtunwali</b>	a code of conduct to which Pashtuns adhere that focuses on “maintaining honor and reputation” (Barfield 2010: 25, 59; Cathell 2009: 3; Goodson 2001: 15-16; Lamer and Foster 2011). It is also also referred to as a “code of principles” (Barfield 2010), a social code (Cathell 2009), and a code of behavior (Barfield 2010). Alternate spellings include <i>Pushtunwali</i> (Dupree 1973:126) and <i>Pukhtunwali</i> (Ahmed 1980)
<b>pisé</b>	walls made of mudbrick
<b>pukio</b>	Also <i>puquio</i> (Peru), <i>apantli</i> (Mexico), and <i>mina</i> (Spain). A karez or filtration gallery.
<b>purdah</b>	1. a theme or principle of Pashtunwali that translates as “gender differences” (Goodson 2001: 16; Hawkins 2009: 17; Kakar n.d.: 3-6) 2. also presented as one of the institutions of Pashtunwali which Barth (1969: 120) defines as “seclusion, and the honourable organization of domestic life”
<b>qala</b>	a self-contained structure that provides “shelter and protection for an extended family, their farm animals, and the provisions necessary for survival” (Szabo and Barfield 1991: 163). Contemporary housing

structures made of mudbrick are also referred to as qalas by scholars (Hallet and Samizay 1980; Szabo and Barfield 1991). Qalas could be small in size and house an extended family or large and house a prominent landlord, his extended family, and his workers (Hallet and Samizay 1980: 123)

<b>sabat</b>	a theme or principle of Pashtunwali that translates as “steadfastness” (Dupree 1973: 126; Goodson 2001: 15-16)
<b>sarchah</b>	the main point-of-source access well located at the most upstream point in a karez system; also known as a “mother well” (Rout 2008)
<b>shab-roz</b>	a night and day cycle for karez water allocations (Kakar 2011: 9; Lee 2006: 4)
<b>shirb</b>	refers to the first of two laws on the use of water rights. The first use of water rights is “the law of thirst or the right of humans to drink or quench their thirst”—also referred to as “haq al shafa” (Faruqui 2001: 2, 23)
<b>shura</b>	1. local council or traditional assembly of elders (Roe 2008; Rout 2008) 2. a theme or principle of Pashtunwali that translates as “council” (Goodson 2001: 16; Hawkins 2009: 17; Kakar n.d.: 3-6)
<b>stupa</b>	a burial or reliquary mound (Knobloch 2002:173)
<b>sharia</b>	Islamic system of law (Pain 2010: vi; Pain and Kantor 2010)
<b>shufa</b>	aspect of Sharia law that requires the agreement of neighbors before land can be sold (Pain 2010: vi; Pain and Kantor 2010)
<b>tepe (tell)</b>	an artificial mound made of debris of foundations and collapsed mudbrick structures (Knobloch 2002:173)
<b>tureh</b>	a theme or principle of Pashtunwali that translates as “sword” (Dupree 1973: 126; Goodson 2001: 15-16)
<b>wasita</b>	“connection”; a relationship to someone in a position of power or influence (Pain 2010: vi, 10)
<b>wudu</b>	ritual ablution (Faruqui 2001: 1)

## Appendix B: Cataloged Karezes Maywand, District

### Mapped Karez Vertical Access Shafts

Karez_ID	Active	Karez_type	Legnth (m)	Notes
K1	1	active	1829	
K1b1	1	active	176	branch of K1
K1b2	1	active	214	branch of K1
K1relict1	0	relict	316	relict part of K1
K1relict2	0	relict	95	possible relict part of K1
K1relict3	0	relict	308	possible relict part of K1
K1relict4	0	relict	191	possible relict part of K1
K1relict5	0	relict	109	possible relict part of K1
K6	0	relict	962	not associated with a village
K6relict1	0	relict	130	possible relict part of K6
K8	1	active	1014	may cross the road
K9	1	active	2603	
K31	1	active	2636	comes to the surface oddly
K36	1	active	2780	comes to surface in multiple places
K36b1	1	active	143	branch to K36
K37	1	active	474	
K38	1	active	3590	splits into many canals from the main surface canal
K39	1	active	740	
K40	0	relict	774	difficult to determine wether it is relict or active
K40b1	0	relict	35	branch of K40
K40b2	0	relict	47	branch of K40
K41	0	undetermined	939	this karez has lots of shaft scars
K41relict1	0	relict	68	relict part of K41
K42	0	relict	649	relict
K43	0	undetermined	531	
K44	2	undetermined	136	relict
K45	1	active	1104	
K58	1	active	2464	
K58b1	1	active	172	branch of K58
K59	1	active	3502	
K60	1	active	2041	crosses roads
K62	1	active	2860	
K62b1	1	active	133	branch of K62
K62b2	2	undetermined	72	undetermined branch K62
K62rel1	0	relict	259	relict part of K62

### Mapped Karez Vertical Access Shafts (cont.)

Karez_ID	Active	Karez_type	Legnth (m)	Notes
K64	1	active	2381	comes to surface between shafts
K65	1	active	1289	crosses road
K66	1	active	2682	crosses road
K154	2	undetermined	1646	not associated with a village but runs near mound
K155	2	undetermined	1354	
K157	0	relict	1279	this karez may branch
K157b1	0	relict	282	possible branch of K157
K157b2	0	relict	260	possible branch of K157
K197	2	undetermined	2677	branches oddly
K220	1	active	366	
K221	0	undetermined	394	
K222	1	active	757	difficult to determine where the surface canal starts
K223	1	active	1718	contains modified older sections
K223b1	2	undetermined	245	branch of K223
K223b2	2	undetermined	24	branch of K223
K223rel1	0	relict	361	relict part of K223
K224	1	active	220	
K225	0	relict	783	not associate with a village
K225b1	0	relict	155	Branch to K225
K226	2	undetermined	377	undetermined part of K226
K226	1	active	474	
K227	2	undetermined	723	undetermind
K228	0	relict	205	relict
K228b1	0	relict	77	branch to K228
K228rel1	0	relict	625	possible relict part of K228
K229	1	active	1994	
K230	1	active	1851	hard to see where the surface canal starts
K231	0	relict	453	relict
K232	0	relict	70	surface canal is difficult to determine
K232rel1	0	relict	45	possible relict part of K232
K232rel2	0	relict	45	possible relict part of K232
K233	0	relict	59	karez has lots of shaft scars
K233rel1	0	relict	30	relict part of K233
K233rel2	0	relict	67	relict part of K233
K234	0	relict	74	relict

**Mapped Karez Vertical Access Shafts (cont.)**

<b>Karez_ID</b>	<b>Active</b>	<b>Karez_type</b>	<b>Legnth (m)</b>	<b>Notes</b>
K236	0	relict	236	relict part of K236
K236	0	relict	153	relict
K258	2	undetermined	3523	may be modified
K259	0	relict	916	
K26	1	active	1459	modified older sections
K26relict1	0	relict	418	relict part of K26
K26relict2	0	relict	241	relict part to K26
K263	1	active	240	active
K264	0	relict	1232	relict
K264rel1	0	relict	151	relict part of K264
K264rel2	0	relict	330	relict part of K264
K265	0	relict	1007	relict
K265rel1	0	relict	390	relict part of K265
K265rel2	0	relict	184	relict part of K265
K266	0	relict	1575	relict
K267	0	relict	756	relict

### Mapped Karez Surface Canals

Karez_ID	Active	Karez_type	Legnth (m)	Notes
SCK1	1	active	575	
SCK1s1	1	active	360	surface canal split of K1
SCK1s2	1	active	229	surface canal split of K1
SCK8	1	active	811	
SCK9	1	active	1392	
SCK26	0	relict	579	surface canal of K26
SCK31	1	active	1058	has bridges over surface canal
SCK36	1	active	516	difficult to follow surface canal
SCK37	1	active	184	surface canal split of K37
SCK37s1	1	active	98	surface canal split of K37
SCK38	1	active	2642	has multiple surface canals
SCK39	1	active	293	surface canal of K39
SCK40	0	relict	793	not clear if this is the surface canal for K40
SCK41	0	relict	317	
SCK43	0	relict	278	
SCK44	2	undetermined	216	surface canal of K44
SCK44s1	2	undetermined	203	surface canal split of K44
SCK44s2	2	undetermined	103	surface canal split of K44
SCK44s3	2	undetermined	28	surface canal split of K44
SCK44s4	0	relict	115	surface canal split of K44
SCK44s5	0	relict	53	surface canal split of K44
SCK45	1	active	231	
SCK58	1	active	2731	long surface canal
SCK59	1	active	1486	surface canal of K59
SCK59s1	1	active	500	surface canal split of K59
SCK59s2	1	active	713	surface canal split of K59
SCK59s3	1	active	86	surface canal split of K59
SCK60	1	active	718	crosses road
SCK62	0	relict	750	surface canal difficult to see
SCK64	1	active	1264	
SCK64s1	1	active	246	surface canal split of SCK64
SCK65	1	active	1803	crosses road
SCK66	1	active	1154	crosses road
SCK66s1	1	active	289	surface canal split of SCK66
SCK66s2	1	active	97	surface canal split of SCK66
SCK66s3	1	active	81	surface canal split of SCK66
SCK66s4	1	active	165	surface canal split of SCK66

### Mapped Karez Surface Canals (cont.)

Karez_ID	Active	Karez_type	Legnth (m)	Notes
SCK154	2	undetermined	733	
SCK155	2	undetermined	352	
SCK197	2	undetermined	1958	surface cana is difficult to follow
SCK220	1	active	232	surface canal of K220
SCK222	0	relict	533	
SCK223	0	relict	851	
SCK224	1	active	647	
SCK225	0	relict	700	no associated with a village
SCK226	1	active	598	surface canal of K226
SCK226s1	1	active	1016	surface canal split of K226
SCK226s2	1	active	420	surface canal split of K226
SCK227	2	undetermined	362	surface canal of K227
SCK228	0	relict	558	surface canal of K228
SCK229	0	relict	3209	difficult to see where surface canal ends
SCK229rel	0	relict	242	relict surface canal of K229
SCK230	1	active	847	surface canal of K230
SCK230s1	1	active	84	surface canal split of K230
SCK231	0	relict	137	relict
SCK232s1	0	relict	61	relict surface canal of K232
SCK233	0	relict	83	surface canal of K233
SCK233s1	0	relict	137	relict surface canal of K233
SCK234	0	relict	168	surface canal of K234
SCK236	0	relict	183	surface canal of K236
SCK258	1	active	938	has two bridges over over surface canal
SCK259	0	active	82	
SCK263	1	active	317	surface canal of K263
SCK263rel	0	relict	188	relict surface canal of K263
SCK263s1	1	active	65	surface canal split of K263
SCK264	0	relict	293	relict surface canal of K264
SCK266	0	relict	320	surface canal of K266
SCK26s1	1	active	149	surface canal split of K26
SCK26s2	1	active	42	surface canal split of K26

## **Appendix C: Archaeological Gazetteer of Maywand District, Kandahar**

Appendix:

An Archaeological Gazetteer of Maywand

District, Kandahar Province, Afghanistan

## **C.1. Introduction**

This gazetteer is the compilation of catalog entries that explain the locations and describes each of the features, as well as providing possible temporal affiliations. By using comparative sources, such as the Archaeological Gazetteer of Afghanistan (Ball 1982) it was possible to assign broad temporal affiliations and define feature types.

## **C.2. Cross Reference Index**

**Circumvallation features:** Feature 5, Feature 8, Feature 11, Feature 13, Feature 33, Feature 58, Feature 76, Feature 84, Feature 95, Feature 96, and Feature 105.

**Disturbed features:** Feature 5, Feature 13, Feature 19, Feature 27, Feature 35, Feature 38, Feature 39, Feature 49, Feature 50, Feature 53, Feature 72, Feature 84, and Feature 87.

**Mounds:** Feature 20, Feature 22, Feature 23, Feature 27, Feature 28, Feature 37, Feature 41, Feature 42, Feature 44, Feature 45, Feature 47, Feature 48, Feature 49, Feature 51, Feature 52, Feature 53, Feature 56, Feature 57, Feature 59, Feature 60, Feature 61, Feature 71, Feature 78, Feature 92, Feature 93, Feature 94, Feature 97, and Feature 101.

**Mounds with modern reuse:** Feature 10, Feature 21, Feature 31, Feature 34, Feature 43, Feature 62, Feature 63, Feature 98, and Feature 99.

**Qalas:** Feature 32, Feature 68, and Feature 100.

**Qalas with modern reuse:** Feature 24, Feature 29, and Feature 64.

**Scars, nomadic or semi-nomadic encampments:** Feature 3, Feature 6, Feature 7, Feature 16, Feature 17, Feature 25, 36, Feature 85, and Feature 104.

**Scars, undetermined:** Feature 15, Feature 81, and Feature 82.

**Square features:** Feature 39, Feature 40, Feature 54, Feature 55, Feature 77, Feature 79, Feature 102, and Feature 103.

**Tepes:** Feature 9, Feature 18, 26, Feature 30, Feature 46, Feature 69, Feature 70, and Feature 88.

**Unidentified structures:** Feature 2, Feature 12, Feature 36a, Feature 73, Feature 74, Feature 75, Feature 83, Feature 89, and Feature 91.

### C.3. Table of Features Identified

Feature Number	Feature Type	Feature Description	Feature Size
1	1	Undetermined Structure	212.49 m long
2	9	Unidentified structure: A	158 m
3	2	Scars: Nomadic encampment	-
4	1	Undetermined Structure	34 m by 26 m
5	7	Circumvallation feature: Square	41 m by 40 m
6	2	Scars: Nomadic encampment	-
7	2	Scars: Nomadic encampment	-
7a	0	Other architecture	5 m by 5 m
8	7	Circumvallation feature: Circular	58 m by 68 m
9	5	Tepe	31 m by 23 m
10	4	Mound: modern reuse	41 m by 24 m
11	7	Circumvallation feature: Square	72 m by 69 m
12	9	Unidentified structure: B	81 m by 61 m
13	7	Circumvallation feature: Oval	61 m by 37 m
14	1	Undetermined Structure	48 m by 36 m
15	2	Scars: Undetermined	-
16	2	Scars: Nomadic encampment	-
17	2	Scars: Nomadic encampment	-
18	4	Mound	24 m by 23 m
19	1	Undetermined Structure	14 m by 21 m
20	4	Mound	15 m by 17 m
21	4	Mound: Modern reuse	66 m by 29 m
22	4	Mound	30 m by 45 m
23	4	Mound	18 m by 14 m
24	3	Qala: Modern reuse	103 m by 104 m
25	2	Scars: Nomadic encampment	-
26	5	Tepe	88 m by 64 m
27	4	Mound	41 m by 38 m
28	4	Mound	29 m by 24 m
29	3	Qala: Modern reuse	143 m 154 m
30	5	Tepe	46 m by 35 m
31	4	Mound: modern reuse	31 m by 22 m
32	3	Qala	81 m by 79 m
33	7	Circumvallation feature: circular	34 m by 33 m
34	4	Mound: Modern reuse	18 m by 13 m
35	1	Undetermined Structure	53 m by 46 m

**Table of Features Identified (cont.)**

<b>Feature Number</b>	<b>Feature Type</b>	<b>Feature Description</b>	<b>Feature Size</b>
36	2	Scars: Nomadic encampment	-
36a	9	Unidentified structure: C	29 m by 24 m
37	4	Mound	23 m by 23 m
38	8	Square feature	52 m by 49 m
39	8	Square feature	68 m by 66 m
40	8	Square feature	66 m by 51 m
41	4	Mound	21 m by 17 m
42	4	Mound	16 m by 23 m
43	4	Mound: Modern reuse	73 m by 74 m
44	4	Mound	143 m by 73 m
45	4	Mound	43 m by 64 m
46	5	Tepe	120 m by 114 m
47	4	Mound	96 m by 89 m
48	4	Mound	42 m by 40 m
49	4	Mound	30 m by 27 m
50	5	Tepe	23 m by 23 m
51	4	Mound	39 m by 48 m
52	4	Mound	35 m by 27 m
53	4	Tepe	28 m by 33 m
54	8	Square feature	47 m by 48 m
55	8	Square feature	41 m by 34 m
56	4	Mound	33 m by 35 m
57	4	Mound	36 m by 34 m
58	7	Circumvallation feature: Circular	73 m by 66 m
59	4	Mound	18 m by 15 m
60	4	Mound	23 m by 27 m
61	4	Mound	19 m by 25 m
62	4	Mound: Modern reuse	49 m by 41 m
63	4	Mound: Modern reuse	77 m by 39 m
64	3	Qala: Modern	485 m by 309 m
65	1	Undetermined Structure	4.5 m by 4.5 m
66	1	Undetermined Structure	16 m by 16 m
67	1	Undetermined Structure	12.5 m by 7 m
68	3	Qala	97 m by 100 m
69	5	Tepe	26 m by 24 m
70	5	Tepe	41 m by 40 m
71	4	Mound	30 m by 29 m
72	1	Undetermined Structure	55 m by 34 m

**Table of Features Identified (cont.)**

<b>Feature Number</b>	<b>Feature Type</b>	<b>Feature Description</b>	<b>Feature Size</b>
73	9	Unidentified structure: C	45.6 m by 38 m
74	9	Unidentified structure: C	39 m by 33 m
75	9	Unidentified structure: C	32 m by 35 m
76	7	Circumvallation feature: Circular	54 m by 54 m
77	8	Square feature	34 m by 32 m
78	4	Mound	58 m by 38 m
79	8	Square feature	39 m by 42 m
80	1	Undetermined Structure	23 m by 23 m
81	2	Scars: Undetermined	-
82	2	Scars: Undetermined	-
83	9	Unidentified structure: C	54 m by 24 m
84	7	Circumvallation feature: Square	39 m by 35 m
85	2	Scars: Nomadic encampment	-
86	5	Tepe	32 m by 33 m
87	1	Undetermined Structure	40 m by 21 m
88	5	Tepe	37 m by 35 m
89	9	Unidentified structure: C	42 m by 26 m
90	1	Undetermined Structure	46 m by 33 m
91	9	Unidentified structure: C	61 m by 37 m
92	4	Mound	16 m by 15 m
93	4	Mound	65 m by 65 m
94	4	Mound	24 m by 24 m
95	7	Circumvallation feature: Square	53 m by 48 m
96	7	Circumvallation feature: Square	45 m by 51 m
97	4	Mound	64 m by 75 m
98	4	Mound: modern reuse	86 m by 89 m
99	4	Mound: modern reuse	60 m by 105 m
100	3	Qala	131 m by 109 m
101	7	Circumvallation feature: Circular	64 m by 61 m
102	8	Square feature	50 m by 50 m
103	8	Square feature	93 m by 143 m
104	2	Scars: Nomadic encampment	255 m by 281 m
105	7	Circumvallation feature: Circular	23 m by 21 m

## C.4. Gazetteer Entries

### Feature 1 (Undetermined structure)

*Location:* Situated apx. 3.79 km northeast of Gach Karez Kalay and 4.52 km northwest of Nasu Kalay. Feature 1 is situated apx. 3.14 km northeast of Feature 8 and apx. 3.32 km northwest of Feature 20. Maywand District, Kandahar Province.

*Description:* Feature 1 measures approximately 212.49 m from the east end to the west end in a straight line. There is a small cemetery located south of the feature approximately 100.27 m westward from the east end of the feature. There is a karez in proximity to this feature and runs northeast to southwest intersecting the feature. Some of the vertical access shafts of the karez that are situated close to the feature appear filled in while others, a slight distance away, appear open.

*Image:*



*(orthoimagery courtesy of USAGC, 2008)*

*Dates:* Undetermined.

*Comparative features:* None.

## Feature 2 (Unidentified Structure: A)

*Location:* Situated apx. 2.23 km southwest of Golojan Village<sup>112</sup> and 2.37 km northeast of Eshqabad Village. Feature 2 is situated apx. 1.87 km northwest of Feature 6 and 1.08 km northeast of Feature 5. Maywand District, Kandahar Province.

*Description:* This feature seems to be connected to another portion or structure through what may be a ramp. Feature two runs east to west on the landscape, measures approximately 158 m long, and is surrounded by agricultural fields.

*Image:*



*(orthoimagery courtesy of USAGC, 2008)*

*Dates:* Undetermined.

*Comparative features:* This feature has architectural components to it. However, it is not similar to any of the features in the Archaeological Gazetteer of Afghanistan (Ball 1982). As such, it is difficult to categorize precisely.

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<sup>112</sup> Golojan Village is not situated within the study area but is still in the District of Maywand.

### Feature 3 (Scars: Nomadic or Semi-sedentary Encampment)

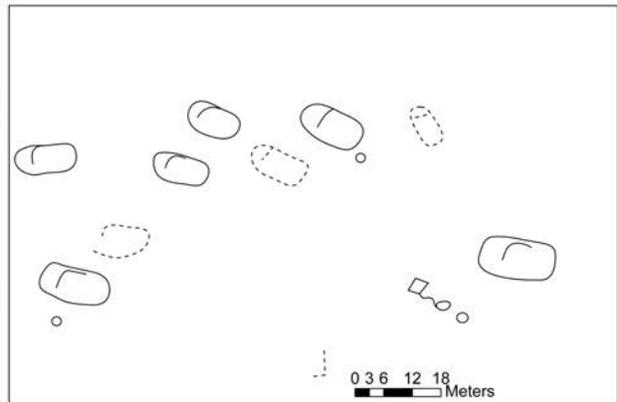
*Location:* Situated apx. 7.69 east-northeast of Eshqabad Village, 4.73 km northeast of Feature 15, and 5.21 km east-northeast of Feature 7. Maywand District, Kandahar Province.

*Description:* This feature consists of multiple “scars” on the landscape that may represent short walls, or foundations, for tents used by semi-sedentary peoples. A visual analysis of the orthorectified imagery suggests that the eastern wall may be taller than the other walls.

*Image:*



*Drawing:*

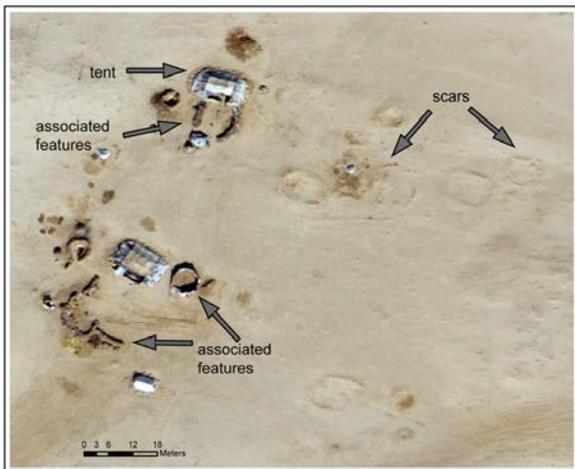


*(orthoimagery courtesy of USAGC, 2008; drawing by A. Egitto from orthoimagery)*

*Dates:* Undetermined

*Comparative features:* This conclusion is inferred through a comparison of inhabited locations in orthorectified imagery (USAGC 2008). Similar features within the Maywand study include Features 6, 7, 15, 16, 25, 36, 85, and 104.

*Comparative image:*



*(orthoimagery courtesy of USAGC, 2008)*

#### Feature 4 (Undetermined structure)

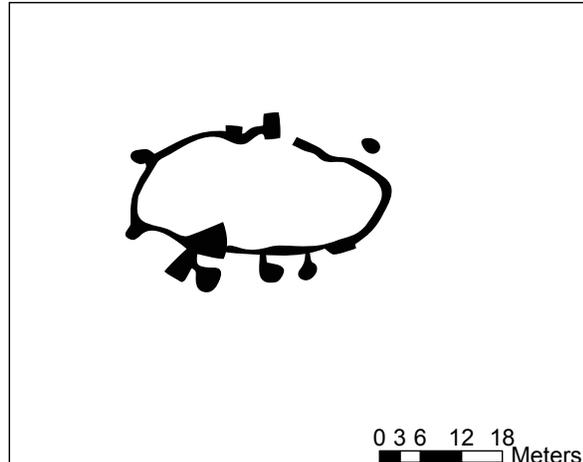
*Location:* Situated apx. 1.69 km south of Moshak Village<sup>113</sup> and apx. 2.18 km northeast of Ezabad Village. Feature 4 is situated apx. 1.88 km west-northwest of Feature 5 and 1.51 km north of Feature 10. Maywand District, Kandahar Province.

*Description:* This feature is an oval structure (34 m by 26 m).

*Image:*



*Drawing:*



*(orthoimagery courtesy of USAGC, 2008; drawing by A. Egitto from orthoimagery)*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

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<sup>113</sup> Moshad Village is not situated within the study area but is still in the District of Maywand.

## Feature 5 (Circumvallation Feature: Square)

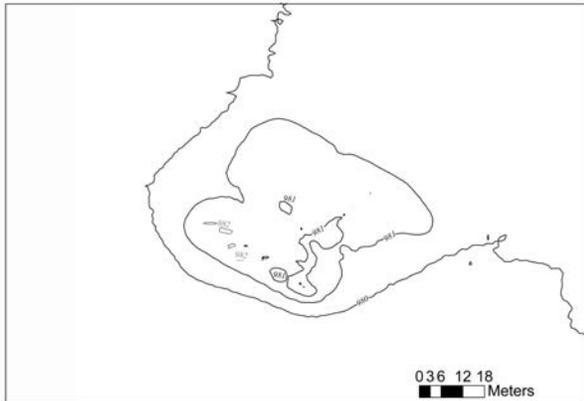
*Location:* Situated apx. 1.38 km north of Eshqabad Village and 1.08 km southwest of Feature 2. Feature 5 is situated apx. 1.08 km southwest of Feature 2 and 1.88 km east-southeast of Feature 4. Maywand District, Kandahar Province.

*Description:* This feature is square (41 m by 40 m). The term “circumvallation” was chosen to classify this structure because its function is unknown but shows signs of containing an outer wall. The feature could contain a square wall and may have a depression in the center. Other possible structure types include qala or caravanserai. The site layout of Feature 5 appears similar to Mug Qala (Ball 1982:456) in size and shape, but towers are not visible. This feature shows signs of being disturbed.

*Image:*



*Contour lines:*

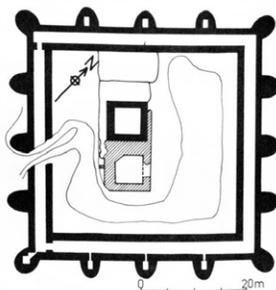


(orthoimagery courtesy of USAGC, 2008; contours derived from Lidar data USAGC 2008)

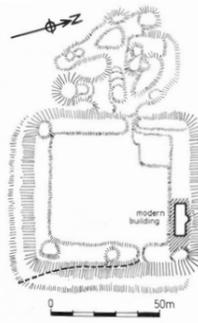
*Dates:* May date as early as the Medieval or Historic periods.

*Comparative features:* A better representation of Feature 5 may be the site of Cham Qala (Ball 1982:430); however Feature 5 is nearly half the size of Cham Qala. Similar features within the Maywand study include Feature 11 that is still slightly larger.

*Comparative images:*



MUG QAL'A  
(Ball 1982: 456)



CHAM QAL'A  
(Ball 1982: 430)

## Feature 6 (Scars: Nomadic or Semi-sedentary Encampment)

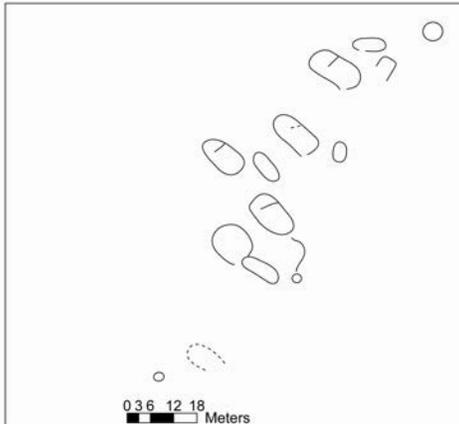
*Location:* Situated apx. 2.45 km east-northeast of Eshqabad Village. This feature is situated north of a tributary—the same tributary that Feature 7, Feature 16, and Feature 17 are situated on. Feature 6 is located 108 m northwest of Feature 7 and 1.87 km southeast of Feature 2. Maywand District, Kandahar Province.

*Description:* This feature consists of multiple “scars” on the landscape that may represent short walls, or foundations, for tents used by semi-sedentary peoples. Refer back to Feature 3 for a larger discussion of these kinds of features. There appears to be some “stains” in the lower two-thirds portion of the image. These “stains” do not appear in the hillshade imagery as being elevated and so they were not drawn. Further, they vary in form from the features identified as possible tent remains.

*Image:*



*Drawing:*

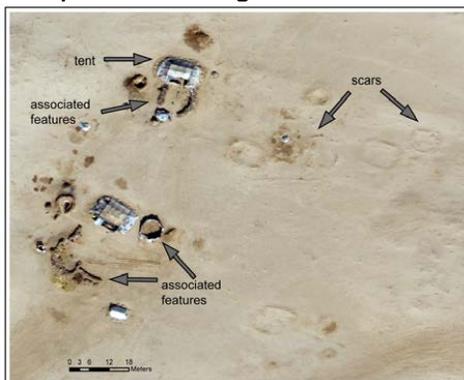


(orthoimagery courtesy of USAGC, 2008; drawing by A. Egitto from orthoimagery)

*Dates:* Undetermined.

*Comparative features:* Similar features within the Maywand study include Features 3, 7, 15, 16, 25, 36, 85, and 104.

*Comparative image:*



(orthoimagery courtesy of USAGC, 2008)

## Feature 7 (Scars: Nomadic or Semi-sedentary Encampment)

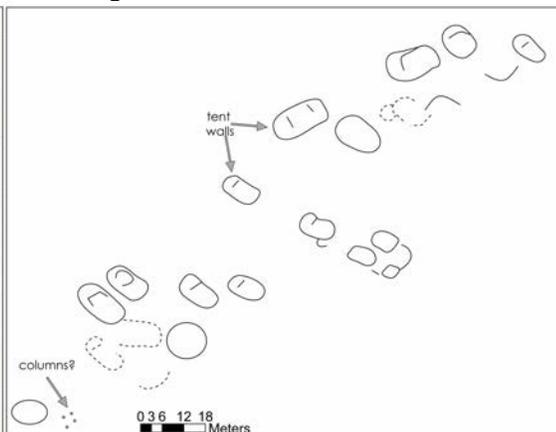
**Location:** Situated 2.48 km east-northeast of Eshqabad Village. This feature is situated south of a tributary—the same tributary that Feature 6, Feature 16, and Feature 17 are situated on. Feature 7 is located 108 m southeast of Feature 6 and 617 m northwest of Feature 13. Maywand District, Kandahar Province.

**Description:** This feature consists of multiple “scars” on the landscape and, as discussed with feature 3, these scars may represent short walls or foundations for tents used by semi-sedentary peoples. For a larger discussion, refer back to feature 3. This feature is also associated with Feature 7A, possible columns.

**Image:**



**Drawing:**



(orthoimagery courtesy of USAGC, 2008; drawing by A. Egitto from orthoimagery)

**Dates:** Undetermined.

**Comparative features:** Scars: Similar features within the Maywand study include Features 3, 6, 15, 16, 25, 36, 85, and 104.

**Comparative image:**



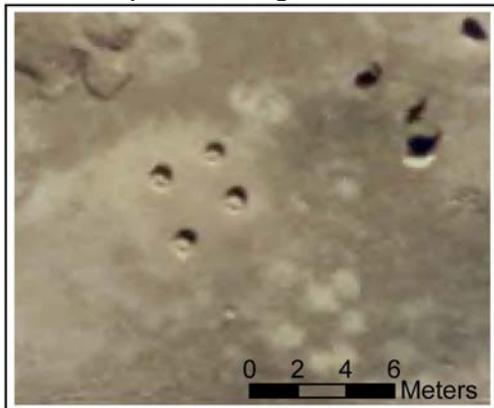
(orthoimagery courtesy of USAGC, 2008)

### Feature 7a (Other architecture: Possible columns)

*Location:* Situated apx. 2.38 km northeast of Eshqabad Village and 5.3 km northeast of Pir Zadeh Village. This feature is situated south of a tributary—the same tributary that Feature 6, Feature 7, Feature 16, and Feature 17 are situated on. Feature 7a is located 114 m southwest of Feature 7 and 174 m south of Feature 6. Maywand District, Kandahar Province.

This feature contains four round objects that may be the remains of columns (Mizuno 1968:plate3.1). Surrounding the four possible columns is also a light stain on the soil in the form of a square that measures ca. 5 m<sup>2</sup>. This measurement is similar to those found at Tepe Durman<sup>114</sup> (Mizuno 1968:99) and Surkh Kotal (Schlumberger 1953:236; 1955:86; 1961:Plate IIIa).

*Columns/pillars image:*



*(orthoimagery courtesy of USAGC, 2008)*

*Comparative Image:*



*Dates:* The columns at Tepe Durman are Hellenistic in style (Mizuno 1968:99 plate 4.1) and may date during Kushan and Kushano-Sassanian Periods ca. 2<sup>nd</sup>-4<sup>th</sup> century AD based on comparative data from Durman Tepe and Surkh Kotal (Ball 2008:266; Mizuno 1968:236; Schlumberger 1955:86).

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<sup>114</sup> Mizuno does not indicate how the measurements were taken. Further, only three columns were located at Tepe Durman.

## Feature 8 (Circumvallation Feature: Circular)

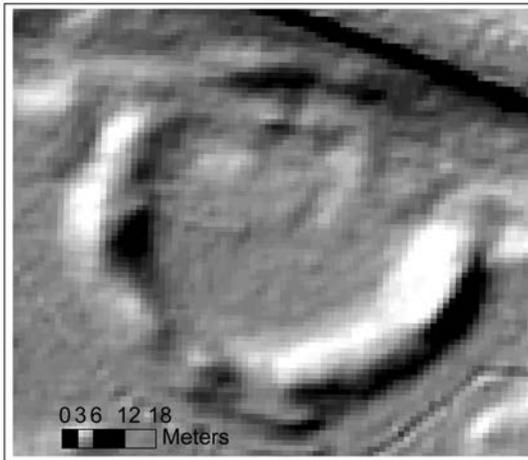
*Location:* Situated apx. 889 m north of the village of Gach Karez Kalay and situated just south of the main road that leads from Kandahar to Herat. Feature 8 is situated apx. 3.14 km southwest of Feature 1 and 704 m west-northwest of Feature 21. Maywand District, Kandahar Province.

*Description:* This feature is categorized as a circular circumvallation feature, measuring apx. 58 m by 68 m. The form of the feature is barely visible in the orthoimagery and represents primarily as a discoloration in the imagery. In reviewing the hillshade model the feature and its form are better defined.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Comparative features:* This feature may be similar to Feature 33 and Feature 58 in the study area.

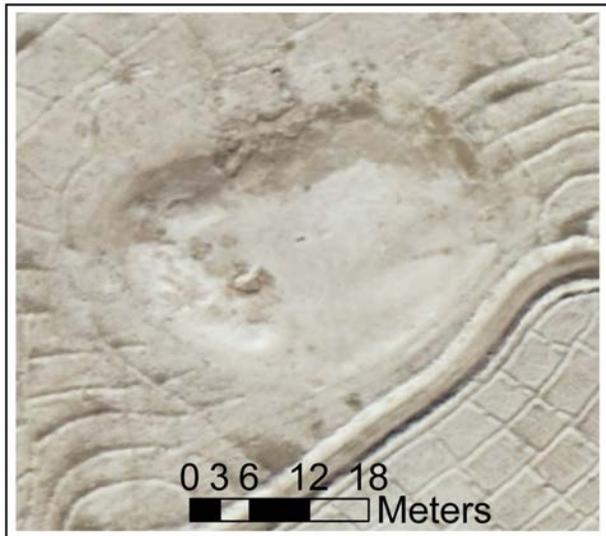
*Dates:* May date as early as the Medieval or Historic periods.

## Feature 9 (Tepe)

*Location:* Situated 1.50 northeast of Nasu Kalay Village and 1.15 km northwest of Esabad Village. Feature 9 is situated 367 m northeast of Feature 18 and 592 m northeast of Feature 19. Maywand District, Kandahar Province.

*Description:* This feature is categorized as an oval mound measuring approximately (31 m by 23 m) and contains a structure on top. It is probable that the structure on top is not associated to the mound beneath it since if there was an association, we would expect there to be more structures situated on top of the mound.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* The mound could date as early as the Neolithic, the structure as early as the Medieval or historical period.

*Comparative features:* None.

### Feature 10 (Mound: with modern reuse)

*Location:* Situated apx. 970 m northeast of Ezabad Village and 1.57 km west of Eshqabad Village. Feature 10 is situated apx. 1.51 km south of Feature 4 and 190 m west of Feature 11. Maywand District, Kandahar Province.

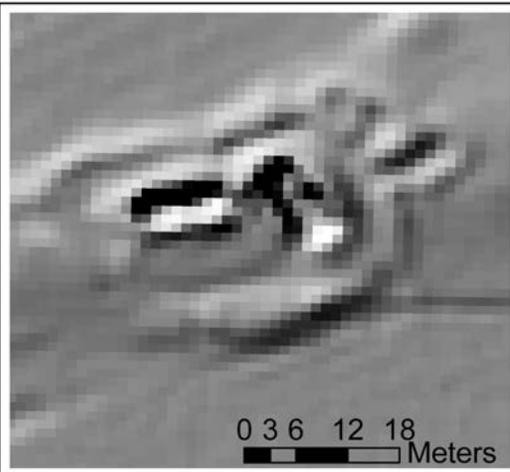
*Description:* This feature is a mound that contains two modern structures on the surface. Using the hillshade model, the feature measures 41 m by 24 m; however, measurements based on the orthorectified imagery suggested that the image is only 25 m by 23 m.

This feature may represent buildings associated with livestock or agriculture that either do not have roofs or the roofs have collapsed. It is even possible that the two structures that comprise this feature were homes and are now ruined and without roofs. A comparison of the landscape demonstrates that homes are generally built inside walls and while there are no walls visible in the orthorectified imagery, an analysis of the hillshade suggests otherwise.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* The mound may date as early as the Neolithic, the structures appear to be modern since they appear clearly in the imagery and do not show extensive signs of decay.

*Comparative features:* None.

## Feature 11 (Circumvallation Feature: Square)

*Location:* Situated 1.15 km northeast of Ezabad Village and 1.4 miles west of Eshqabad Village. Feature 11 is situated 190 m east of Feature 10, 1.45 km south of Feature 4, and 944 m west of Feature 12. Maywand District, Kandahar Province.

*Description:* This feature is square measuring approximately 72 m by 69 m. It contains walls that enclose two higher areas in the south corner of the feature. Until additional data are gathered the term circumvallation feature is the best categorization although other square and rectangular features include qalas and caravanserais as noted with the comparative imagery.

*Image:*

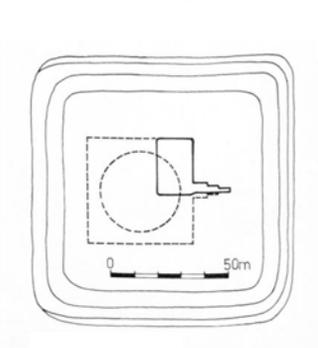


*(orthoimagery courtesy of USAGC, 2008; contours derived from Lidar data from USAGC 2008).*

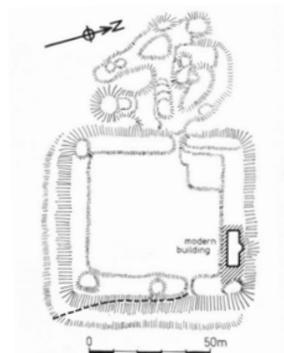
*Dates:* May date as early as the Medieval or Historic periods.

*Comparative features:* Similar in size and shape to Nadir Tepe (Ball 1982:456), Feature 11 also resembles Cham Qala (Ball 1982:430) in both size and shape.

*Comparative images:*



NADIR TEPE  
(Ball 1982: 456)



CHAM QAL'A  
(Ball 1982: 430)

### **Feature 12 (Unidentified Structure: B)**

*Location:* Situated apx. 508 m northwest of Eshqabad Village and is on the east bank of a river system. Feature 12 is situated 1.26 km southwest of Feature 5 and 944 m east of Feature 11. Maywand District, Kandahar Province.

*Description:* This feature measures apx. 81 m by 61 and is categorized as a structure. It is pyramidal in shape.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or historic periods.

*Comparative features:* None in the study area and nothing similar has been identified among the site plans included in the Archaeological Gazetteer of Afghanistan (Ball 1982).

**Feature 13 (Circumvallation feature: oval)**

*Location:* Situated 1.9 km west-northwest of Eshqabad Village. Feature 13 is situated 623 m southwest of Feature 6 and 835 m northwest of Feature 16. Maywand District, Kandahar Province.

*Description:* This feature measures apx. 61 m by 37m is categorized as an oval circumvallation feature.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or historic periods.

*Comparative features:* None.

### Feature 14 (Undetermined structure)

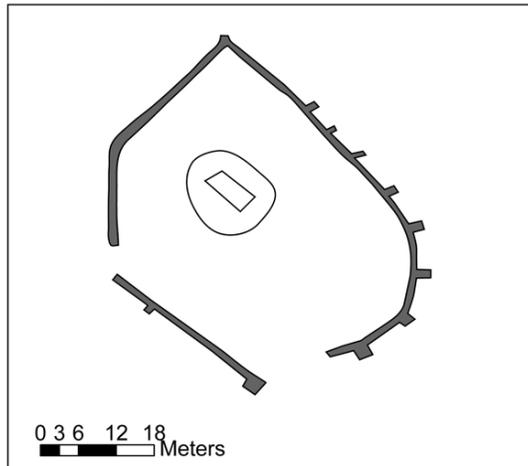
*Location:* Situated apx. 2.9 km east of Eshqabad Village. Feature 14 is situated apx. 388 m west-northwest of Feature 15 and 1.2 km southeast of Feature 7. Maywand District, Kandahar Province.

*Description:* This feature measures apx. 48 m by 36 m and is categorized as a structure that has multiple towers.

*Image:*



*Drawing:*



*(orthoimagery courtesy of USAGC, 2008; drawing by A. Egitto from orthoimagery)*

*Dates:* May date as early as the Medieval or historic periods.

*Comparative features:* None.

### **Feature 15 (Scars: Undetermined)**

*Location:* Situated 3.33 km east of the village of Eshqabad. Feature 15 is 388 m west of Feature 14 and 1.46 km southeast of Feature 7. Maywand District, Kandahar Province.

*Description:* This feature is a series of “scars” on the landscape that may represent low or short walls from associated with tents. See Feature 3 for an in depth discussion of these types of features.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or historic periods.

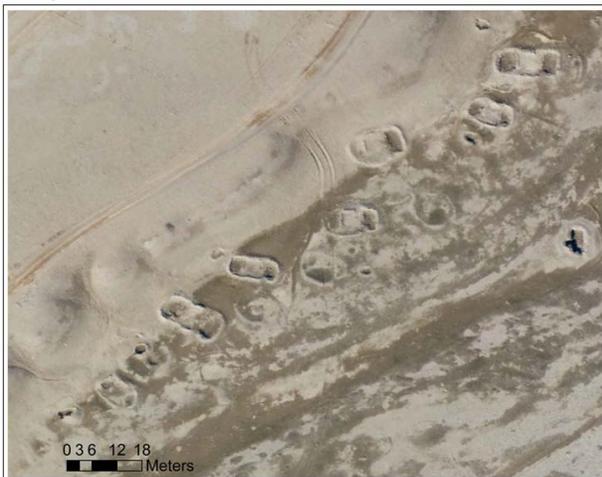
*Comparative features:* These scars on the landscape are not similar to the other “scars” that are identified as nomadic encampments.

## Feature 16 (Scars: Nomadic or Semi-sedentary Encampment)

*Location:* Situated 1.24 km east of the village of Eshqabad and on the north bank of a tributary—the same tributary that Feature 6, Feature 7, and Feature 17 are situated on. Feature 16 is 157 meters west-northwest of Feature 17 and 835 m southwest of Feature 13. Maywand District, Kandahar Province.

*Description:* This feature is a series of “scars” on the landscape that may represent low or short walls from associated with tents. See Feature 3 for an in depth discussion of these types of features.

*Image:*

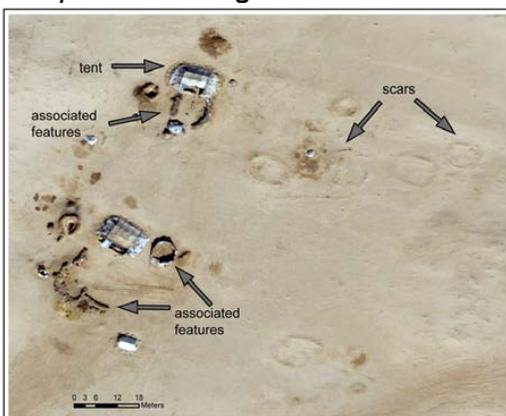


*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* Undetermined.

*Comparative features:* Similar features within the Maywand study include Features 3, 6, 7, 15, 25, 36, 85, and 104.

*Comparative Image:*



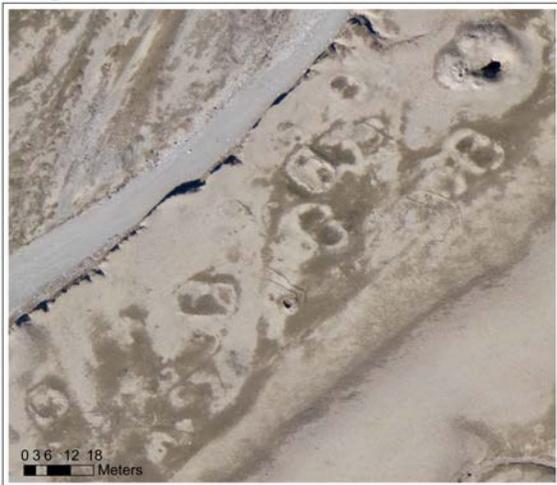
*(orthoimagery courtesy of USAGC, 2008).*

## Feature 17 (Scars: Nomadic or Semi-sedentary Encampment)

*Location:* Situated 1.4 km east of the village of Eshqabad and on the south bank of a tributary—the same tributary that Feature 6, Feature 7, and Feature 16 are situated on. Feature 17 is located 157 m east-southeast of Feature 16 and 748 m southwest of Feature 13. Maywand District, Kandahar Province.

*Description:* This feature is a series of “scars” on the landscape that may represent low or short walls from associated with tents. See Feature 3 for an in depth discussion of these types of features. There appears to be a well associated with these low walls that is visible in the top right part of the image.

*Image:*



(orthoimagery courtesy of USAGC, 2008).

*Dates:* Undetermined.

*Comparative features:* Similar features within the Maywand study include Features 3, 6, 7, 15, 25, 36, 85, and 104.

*Comparative Image:*



(orthoimagery courtesy of USAGC, 2008).

## Feature 18 (Tepe)

*Location:* Situated 1.14 km northeast of Nasu Kalay Village and 1.29 km northwest of Ezabad Village. Feature 18 is situated apx. 287 m east of Feature 19 and 990 m north of Feature 22. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 24 m by 23 m and shows signs of a previous mud-brick structure. As noted above with Feature 9, it is possible that there is not an association between this mound and the mudbrick structure. If there was an association, we would expect there to be more structures situated on top of the mound.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* The mound could date as early as the Neolithic, the structure as early as the Medieval or historical period

*Comparative features:* None.

### **Feature 19 (Undetermined structure)**

*Location:* Situated 1.04 km north of Nasu Kalay Village and 1.57 km west of Ezabad Village. Feature 19 is situated apx. 287 m west of Feature 18 and 1.07 km north of Feature 23. Maywand District, Kandahar Province.

*Description:* This feature is an undetermined structure measuring apx. 14 m by 21 m.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or historic periods.

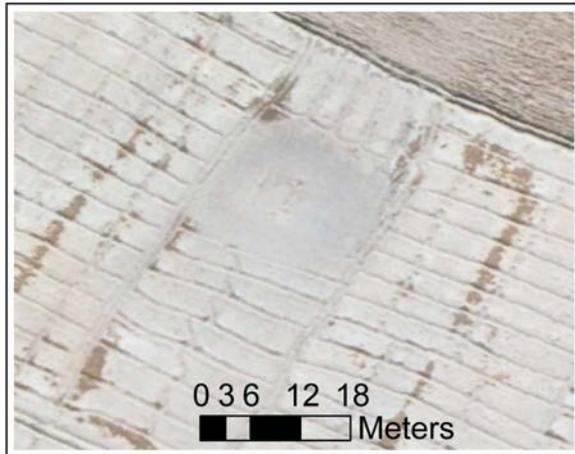
*Comparative features:* None.

## Feature 20 (Mound)

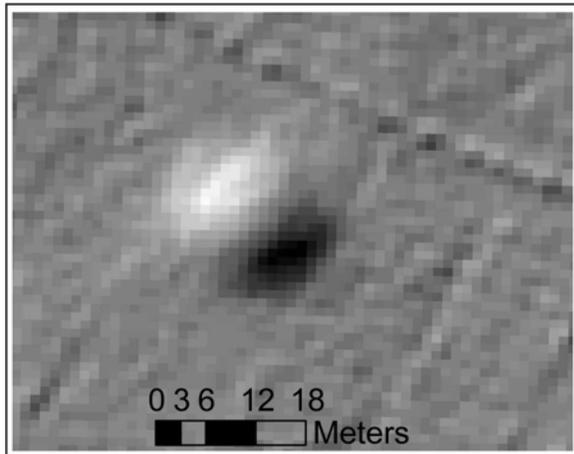
*Location:* Situated 1.2 km northwest of Nasu Kalay Village, 3.32 km southeast of Feature 1, and 1.23 km northwest of Feature 23. Maywand District, Kandahar Province.

*Description:* This feature measures apx. 15 m by 17 m and it appears faint on the landscape probably due to agricultural encroachment surrounding it. The feature appears to be circular but based on measurements is actual oval in form.

*Image:*



*Hillshade model:*



(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).

*Dates:* May date as early as the Neolithic.

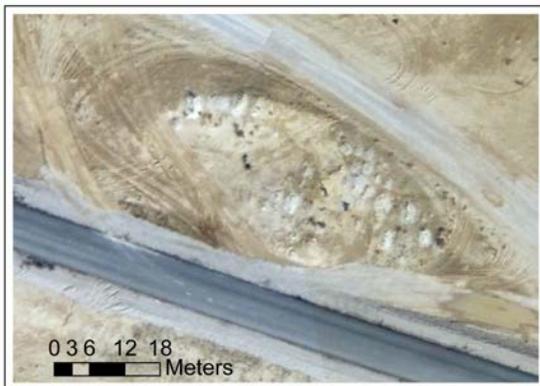
*Comparative features:* None.

### Feature 21 (Mound: with modern reuse)

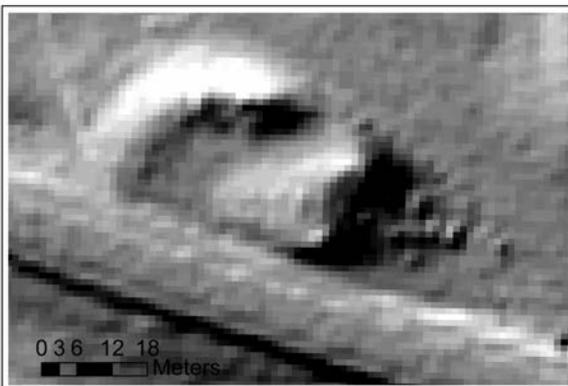
*Location:* Situated apx. 890 m northeast of Gach Karez Kalay Village and north of the road that leads from Kandahar to Herat. This feature is also situated apx. 704 m west-southwest of Feature 8 and 1.11 km north of Feature 27. Maywand District, Kandahar Province.

*Description:* This feature can be categorized as an oval mound (66 m by 29.2 m) in the orthorectified imagery; however, a comparison of the hillshade models suggests that deflation has possibly occurred. It is probable that this mound used to be larger as the shorter side has clearly been impacted by modern road construction. This mound has been reused as a cemetery and graves are visible on the surface.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* The mound may date as early as the Neolithic; the cemetery may date as early as the Medieval Islamic Period.

*Comparative features:* None.

## Feature 22 (Mound)

*Location:* Situated apx. 290 m east of Nasu Kalay Village, 303 m west-northwest of Feature 23, and 990 m south of Feature 18. Maywand District, Kandahar Province.

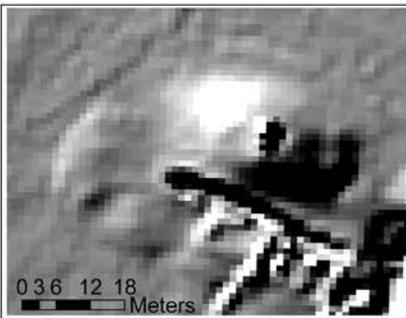
*Description:* This feature measures apx. 30 m by 45 m. Although, the entire area that appears to be avoided by agriculture and encroached upon by modern construction measures apx. 41.2 m by 50.7 m. There is a tree on top of feature and the feature may contain mud-brick remains (possibly modern) on the surface.

It appears circular in the orthorectified imagery; however, an analysis of the hillshade model shows that the feature is actually oval in form. The feature has been impacted by both agricultural and rural development.

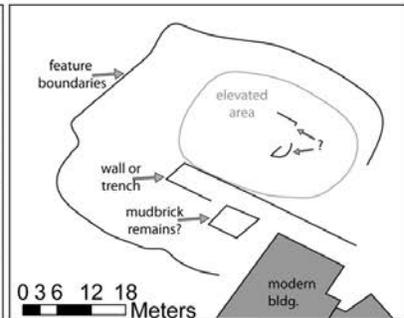
*Image:*



*Hillshade model:*



*Drawing:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008, drawing by A.Egitto from orthoimagery).*

*Dates:* May date as early as the Neolithic. If it contains a mud-brick structure, the structure may date as early as the Medieval or Historic Periods.

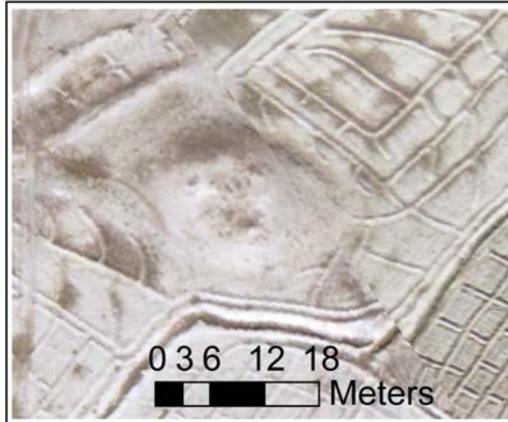
*Comparative features:* None.

### Feature 23 (Mound)

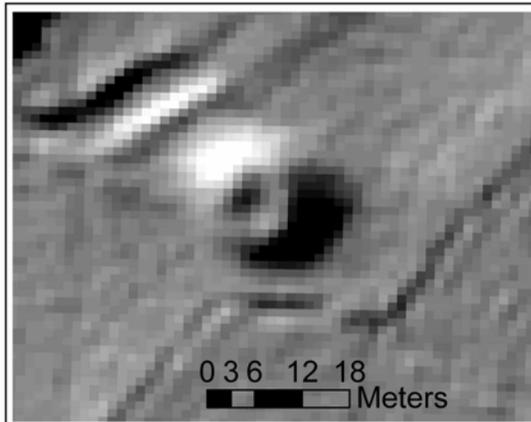
*Location:* Situated 31 m south of Nasu Kalay Village. Feature 23 is situated apx. 303 m southeast of Feature 22, 1.23 km southeast of Feature 20, and 1.07 km south of Feature 19. Maywand District, Kandahar Province.

*Description:* This feature is a circular, possibly oval, mound (18 m by 14 m) that appears faint on the landscape probably due to agricultural activities.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* May date as early as the Neolithic.

*Comparative features:* None.

## Feature 24 (Qala: modern reuse)

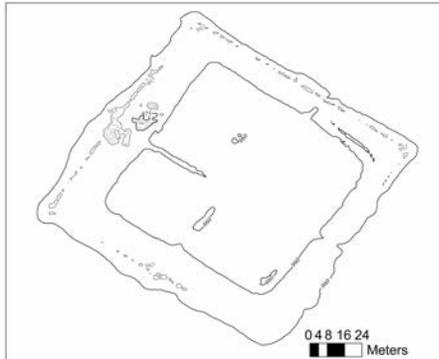
*Location:* Situated 1.01 km east-northeast of Nasu Kalay Village and 993 m southwest of Ezabad Village. Feature 24 is situated apx. 1.08 km northwest of Feature 29 and 906 m southeast of Feature 18. Maywand District, Kandahar Province.

*Description:* This feature is square and measures apx. 103 m by 104 m. The feature shows wear from age but corner towers are still visible. Feature has been reused for agricultural activities. This feature is categorized as a qala—a fortified structure; however, there are no signs of previous architecture inside of the qala. Any ruins of mud-brick structures may have been removed or leveled so that the feature can be reused for agricultural activities.

*Image:*



*Contours lines:*



(orthoimagery courtesy of USAGC, 2008; contours derived from Lidar data from USAGE 2008).

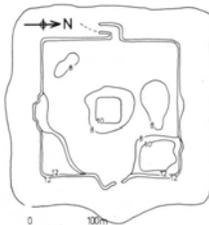
*Dates:* may date as early as the Historic Period. Recent constructions dating during the late 1800s are seen with the qala in Shewaki, near Kabul (Hallet and Samizay 1980:137)

*Comparative features:* Feature 24 is similar to both Jabar Tepe dating to the Early Islamic Period (10<sup>th</sup> – 13<sup>th</sup> century) (Ball 1982:184, 449) and Abu Huraira dating to the Hephthalite/pre-Mongol Islamic (6<sup>th</sup> – 12 century) and Ghaznavid (1000-1050) (Ball 1982:28, 417) but is smaller in size than Abu Huraira.

*Comparative images:*



JABAR TEPE  
(Ball 1982: 449)



ABU HURAIRA  
(Ball 1982: 417)

## Feature 25 (Scars: Nomadic or Semi-sedentary Encampment)

*Location:* Situated apx. 1.08 km south of Eshqabad Village. Feature 25 is situated apx. 1.44 km southwest of Feature 16, 1.9 km northeast of Feature 31, and apx. 1.71 km east of Feature 30. Maywand District, Kandahar Province.

*Description:* This feature is a series of “scars” on the landscape that may represent low or short walls from associated with tents. See Feature 3 for an in depth discussion of these types of features. There are also a number of square feature that appear in the lower left portion of the image that are undetermined.

*Image:*



(orthoimagery courtesy of USAGC, 2008).

*Dates:* Undetermined.

*Comparative features:* Similar features within the Maywand study include Features 3, 6, 7, 15, 16, 36, 85, and 104.

*Comparative image:*



(orthoimagery courtesy of USAGC, 2008).

## Feature 26 (Tepe)

*Location:* Situated 1.39 km east of Gach Karez Kalay, 999 m east-northeast of Feature 27, and 1.2 km southeast of Feature 21. Maywand District, Kandahar Province.

*Description:* This feature is an oval mound measuring apx. 88 m by 64 m that shows signs of possible mudbrick features on top.

*Image:*



*Hillshade model:*

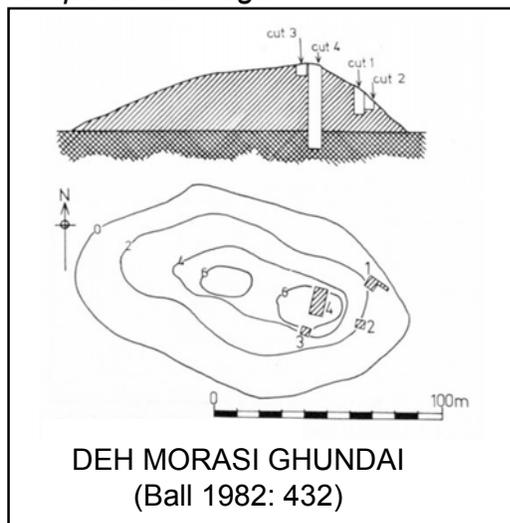


(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).

*Dates:* Mound may date as early as the Neolithic. The mudbrick remains on top may date as early as the Medieval or Historic periods.

*Comparative features:* This feature compares to the site of Deh Morasi Ghundai (Ball 1982:432) both in size and form.

*Comparative image:*

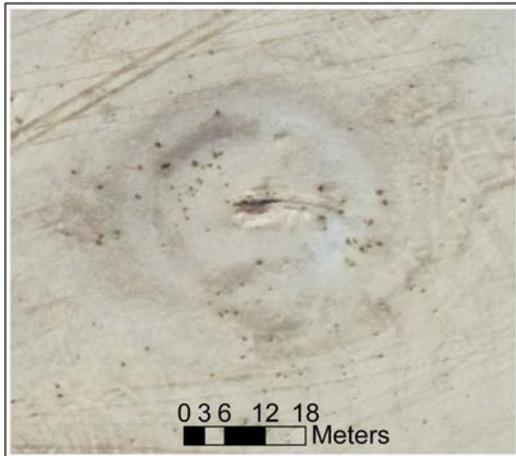


## Feature 27 (Mound)

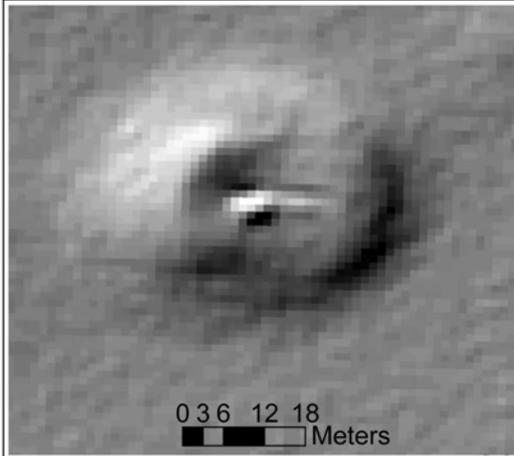
*Location:* Situated 592 m southeast of Gach Karez Kalay. Feature 27 is situated apx. 999 m west-southwest of Feature 26 and 1.11 km south of Feature 21. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 41 m by 38 m.

*Image:*



*Hillshade model:*



(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).

*Dates:* May date as early as the Medieval or historic periods.

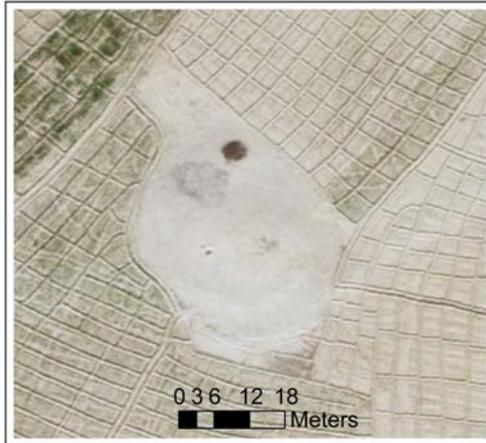
*Comparative features:* None.

## Feature 28 (Mound)

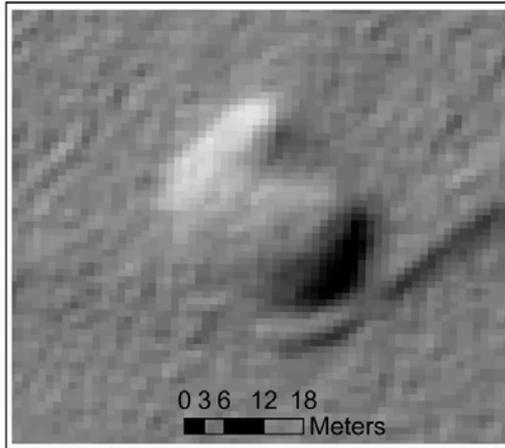
*Location:* Situated apx. 803 m northwest of Mohammadmusa Kalay Village and 878 m southwest of Nasu Kalay. Feature 28 is situated apx. 849 m southwest of Feature 23 and 1.64 km southeast of Feature 20. Maywand District, Kandahar Province.

*Description:* This feature is an oval mound measuring 29 m by 24 m.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* May date as early as the Neolithic Period.

*Comparative features:* None.

## Feature 29 (Qala: modern reuse)

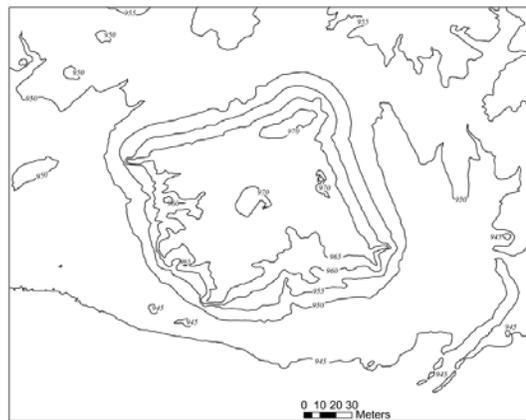
*Location:* Situated apx. 1.56 km east-southeast of Mohamadmusa Kalay Village and 1.37 km south of Ezabad Village. Feature 29 is situated apx. 930 m west of Feature 30 and 1.08 km southeast of Feature 24. Maywand District, Kandahar Province.

*Description:* This feature is square and measures apx. 143 m by 154 m and contains the remains of mud-brick structures on top. The feature can be categorized as a qala—a fortified structure. It appears to be impacted by modern activity—road lead up to the top of the feature as well as a modern rectangular structure.

*Image:*



*Contour lines:*

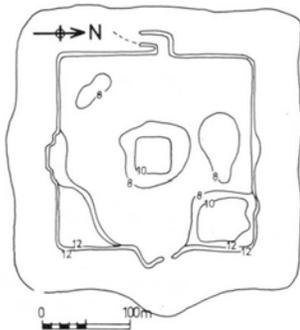


*(orthoimagery courtesy of USAGC, 2008; contours derived from Lidar data from USAGE 2008).*

*Dates:* Undetermined. May date as early as the Historic Period.

*Comparative features:* This feature is similar to Abu Huraira (Ball 1982:417) but Feature 29 is smaller.

*Comparative image:*



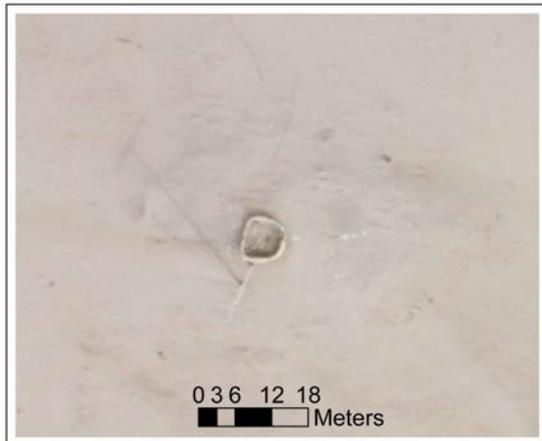
ABU HURAIRA  
(Ball 1982: 417)

### Feature 30 (Tepe)

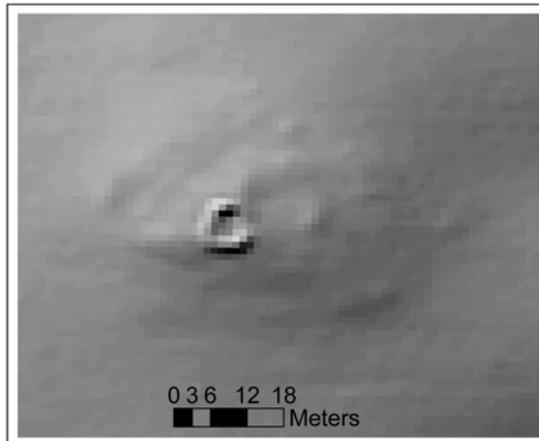
*Location:* Situated apx. 1.23 km north of Pir Zaden Village and 1.65 km southeast of Ezabad Village. Feature 30 is 930 m east of Feature 29 and 640 m northwest of Feature 31. Maywand District, Kandahar Province.

*Description:* This feature appears as though it is a mound that measures 46 m by 35 m based on an analysis of the hillshade model; however contour lines suggest otherwise—measuring 272 m by 149 m.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* The mound may date as early as the Neolithic. The structure may date as early the Medieval or Historic Period.

*Comparative features:* None.

### Feature 31 (Mound: with modern reuse)

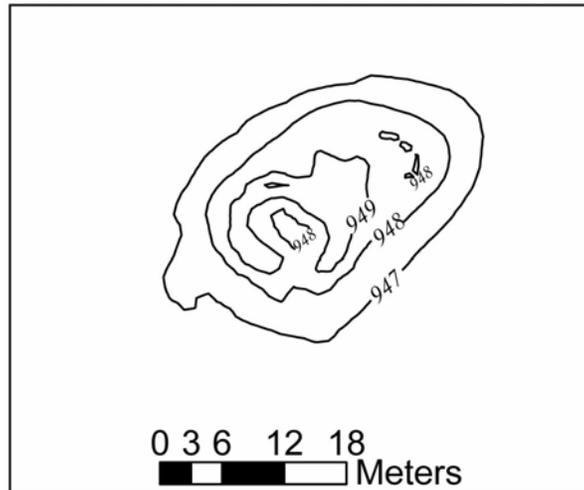
*Location:* Situated 230 m northeast of Pir Zadeh Village and 2.26 km southeast of Ezabad Village. Feature 31 is situated apx. 446 m north of Feature 32, 640 m southeast of Feature 31, and 1.9 km southwest of Feature 25. Maywand District, Kandahar Province.

*Description:* This feature is an oval mound (31 m by 22 m) that has been reused twice. The surface shows evidence of a (possible) modern mud-brick construction and a grave.

*Image:*



*Contour lines:*



*(orthoimagery courtesy of USAGC, 2008; drawing by A. Egitto from orthoimagery).*

*Dates:* The mound may date as early as the Neolithic. The mud-brick remains appear to be modern but may date as early as the Medieval or Historic Periods. The grave situated between the mud-brick remains may date as early as the Islamic Period but it is probable that the grave is modern.

*Comparative features:* none.

## Feature 32 (Qala)

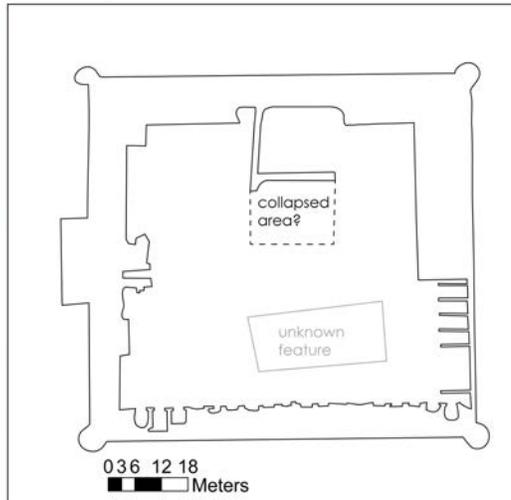
*Location:* Situated apx. 230 m northeast of Pir Zadeh Village and 936 m southwest of Maywand Village. Feature 32 is situated apx. 741 m northwest of Feature 35 and 446 m southeast of Feature 31. Maywand District, Kandahar Province.

*Description:* This feature is categorized as a qala. It is structure in ruins that has four corner towers and measures apx. 81 m by 79 m.

*Image:*



*Drawing:*

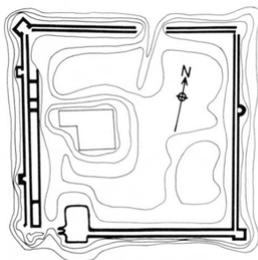


(orthoimagery courtesy of USAGC, 2008; drawing by A. Egitto orthoimagery).

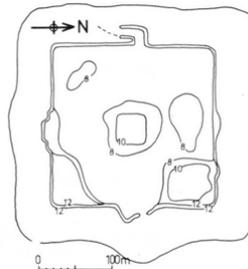
*Dates:* May date as early as the Historic Period. Recent constructions dating during the late 1800s are seen with the qala in Shewaki, near Kabul (Hallet and Samizay 1980:137)

*Comparative features:* Feature 32 is similar to both Jabar Tepe dating to the Early Islamic Period (10<sup>th</sup> – 13<sup>th</sup> century) (Ball 1982:184, 449) and Abu Huraira dating to the Hephthalite/pre-Mongol Islamic (6<sup>th</sup> – 12 century) and Ghaznavid (1000-1050) (Ball 1982:28, 417) but is smaller in size than Abu Huraira.

*Comparative image:*



JABAR TEPE  
(Ball 1982: 449)



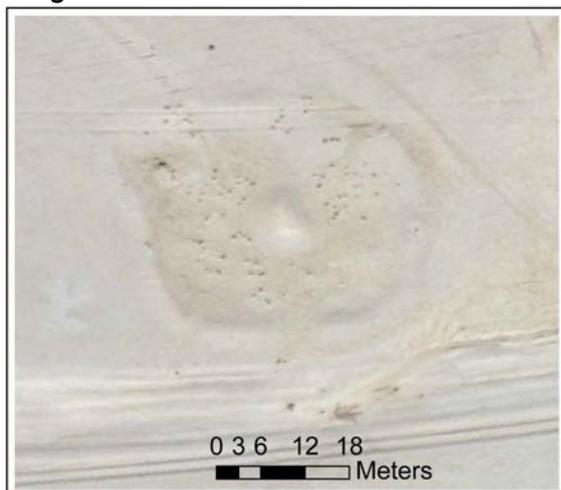
ABU HURAIRA  
(Ball 1982: 417)

### Feature 33 (Circumvallation Feature: Circular)

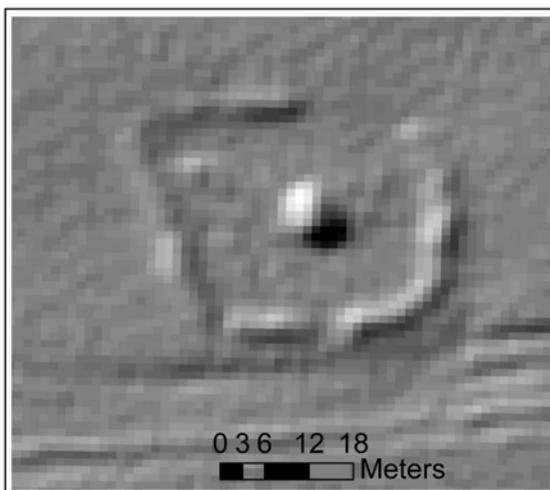
*Location:* Situated apx. 2.4 km northwest of Maku Village and 2.6 km southwest of Gach Karez Kalay. Feature 33 is situated apx. 627 m southwest of Feature 104 and 753 m south of Feature 105. Maywand District, Kandahar Province.

*Description:* This feature is circular circumvallation feature (34 m by 33 m). It may be a small mound or tepe that is enclosed by walls.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* May date as early as the Medieval or historic periods.

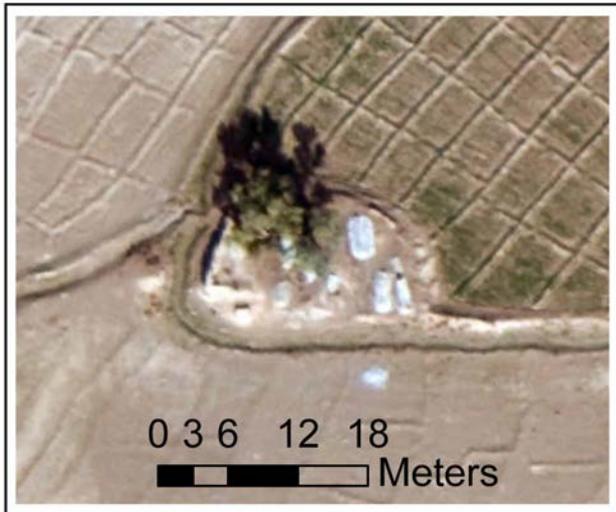
*Comparative features:* None.

### **Feature 34 (Mound: modern reuse)**

*Location:* Situated apx. 184 m west of Mazra Village and 756 m northeast of Feature 42. Maywand District, Kandahar Province.

*Description:* This feature is a mound measuring apx. 18 m by 13 m. Feature has low walls, graves, and a tree on it. This mound has been reused as a cemetery.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* The mound may date as early as the Neolithic; the graves may date as early as the Medieval Islamic Period but based on the clear visibility of the graves, they may be modern.

*Comparative features:*

*Comparative features:* can be found on the Internet at Web addresses [http://www.icosphoto.net/kandahar\\_taliban\\_graveyard/iframe\\_2](http://www.icosphoto.net/kandahar_taliban_graveyard/iframe_2) and <http://framework.latimes.com/2011/01/28/afghanistanaerials/#/11>.

### **Feature 35 (Undetermined structure)**

*Location:* Situated apx. 423 m north of Maywand Village, 814 m east-southeast of Pir Zadeh Village, and 741 m southeast of Feature 32. Maywand District, Kandahar Province.

*Description:* This feature is a undetermined structure (53 m by 46 m) that appears to be disturbed.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or historic periods.

*Comparative features:* None.

### **Feature 36 (Scars: Nomadic or Semi-sedentary Encampment)**

*Location:* Situated apx. 6.5 km east of Maywand Village. Feature is located on the south bank of a tributary but the scars also extend on the north bank of the tributary. Maywand District, Kandahar Province.

*Description:* This feature is a series of “scars” on the landscape that may represent low or short walls from associated with tents. See Feature 3 for an in depth discussion of these types of features.

There is also another feature (Feature 36a) associated with these scars.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* Undetermined.

*Comparative features:* Similar features within the Maywand study area include Features 3, 6, 7, 15, 16, 25, 85, and 104.

*Comparative image:*



*(orthoimagery courtesy of USAGC, 2008).*

### **Feature 36a (Unidentified Structure: C)**

*Location:* Situated apx. 6.5 km east of Maywand Village. Feature 36a is located on the south bank of a tributary but the scars also extend on the north bank of the tributary. Maywand District, Kandahar Province.

*Description:* This feature is a structure (29 m by 24 m) that has an unknown function. There are six similar features within the Maywand study area include Features 73, 74, 75, 83, 89, and 91.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or historic periods.

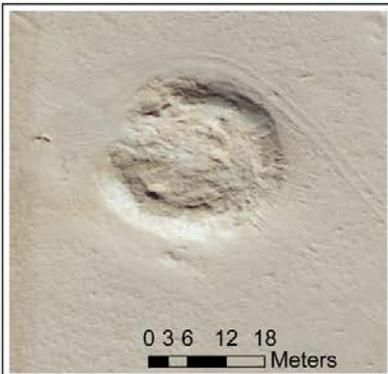
*Comparative features:* none.

### Feature 37 (Mound)

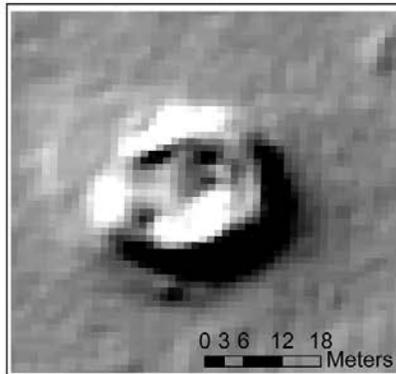
*Location:* Situated apx. 1.13 km east –southeast of Maywand Village and 1.47 km southwest of Khushkhaleq Village. Feature 37 is situated apx. 1.09 km northwest of Feature 64 and 1.07 km east of Feature 38. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 23 m by 23 m.

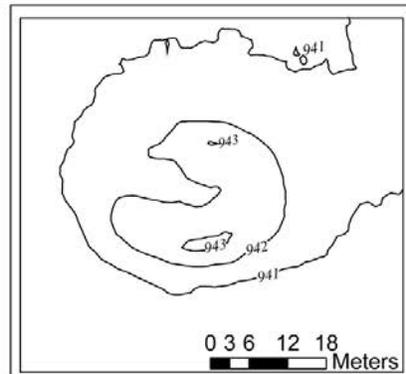
*Image:*



*Hillshade model:*



*Contour lines:*



*(orthoimagery courtesy of USAGC, 2008; hillshade and contours derived from Lidar data from USAGE 2008).*

*Dates:* May date as early as the Neolithic.

*Comparative features:* None.

### Feature 38 (Square/rectangular Feature)

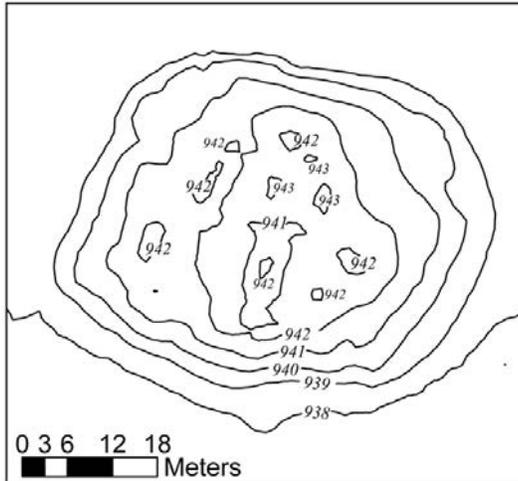
*Location:* Situated 283 m south of Maywand Village and 978 m north of Khushkhaleq Village. Feature 38 is situated apx. 1.07 km west of Feature 37 and 1.98 east-southeast of Feature 64. Maywand District, Kandahar Province.

*Description:* This feature is square, possibly rectangular in shape, (52 m by 49 m) and shows signs of disturbance on the surface.

*Image:*



*Contour lines:*

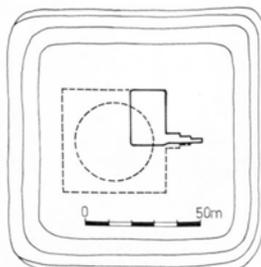


(orthoimagery courtesy of USAGC, 2008; contours derived from Lidar data from USAGE 2008).

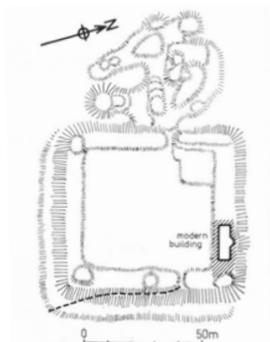
*Dates:* May date as early as the Neolithic or historic periods.

*Comparative features:* Similar in size and shape to Nadir Tepe (Ball 1982:456), Feature 11 also resembles Cham Qala (Ball 1982:430) in both size and shape.

*Comparative images:*



NADIR TEPE  
(Ball 1982: 456)



CHAM QAL'A  
(Ball 1982: 430)

### Feature 39 (Square/rectangular Feature)

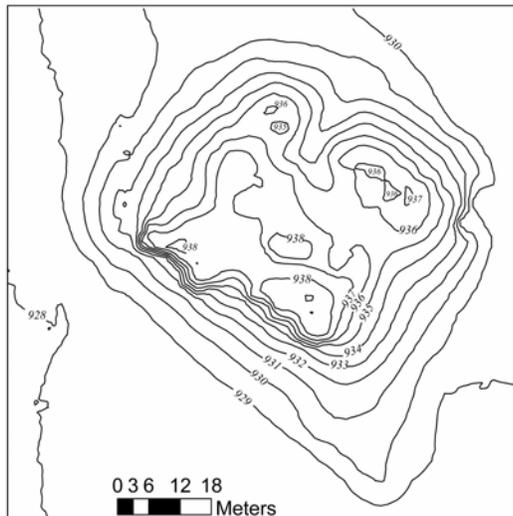
*Location:* Situated apx. 960 m south-southwest of Mazra Village and 1.51 km northwest of Chehel Gazi Village. Feature 39 is situated apx. 178 m west-northwest of Feature 92 and apx. 77 m southeast of Feature 40. Maywand District, Kandahar Province.

*Description:* This feature is a square feature (68 m by 66 m). It may be part of Feature 40.

*Image:*



*Contour lines:*



(orthoimagery courtesy of USAGC, 2008; contours derived from Lidar data from USAGEE 2008).

*Dates:* May date as early as the Medieval or historic period.

*Comparative features:* None.

### **Feature 40 (Square/rectangular Feature)**

*Location:* Situated 897 m south-southwest of Mazra Village, 162 m southeast of Feature 40, and 454 m east-southeast of Feature 43. Maywand District, Kandahar Province.

*Description:* This feature is rectangular measuring apx. 66 m by 51 m. It may be part of Feature 39.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or historic period.

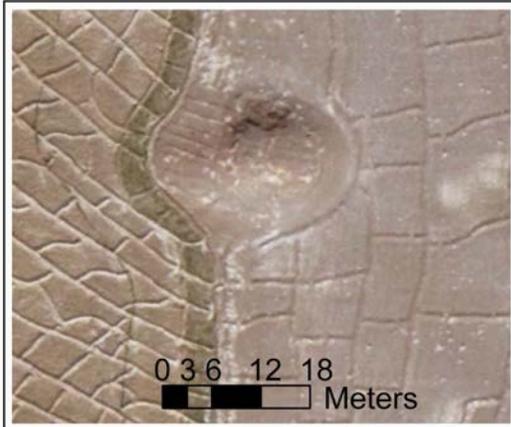
*Comparative features:* None.

### **Feature 41 (Mound)**

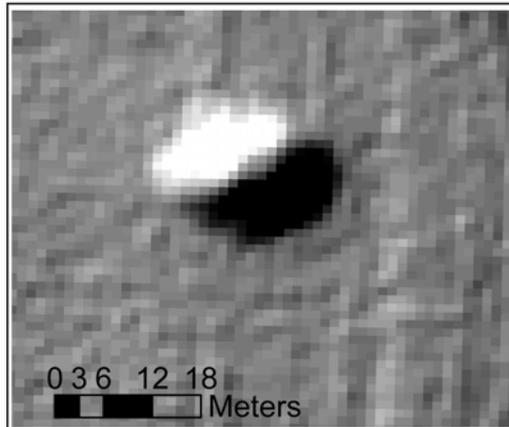
*Location:* Situated apx. 952 m south of Mazra Village and apx. 1.3 km northwest of Chehel Gazi Village. Feature 41 is situated apx. 227 m east-southeast of Feature 39 and 73 m northeast of Feature 92. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 21 m by 17 m.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* May date as early as the Neolithic period.

*Comparative features:* None.

## Feature 42 (Mound)

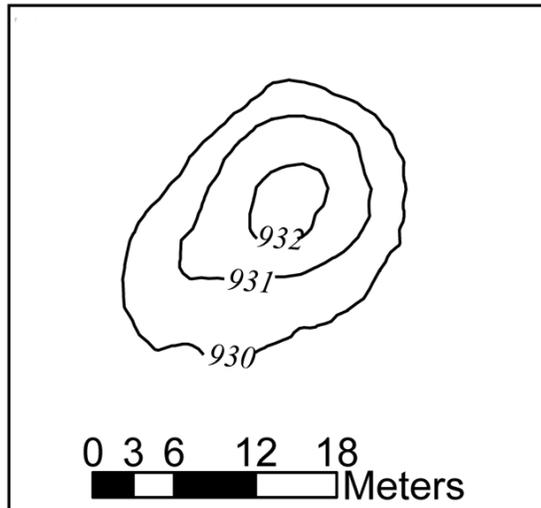
*Location:* Situated apx. 830 m southwest of Mazra Village. Feature 42 is situated apx. 756 m southwest of Feature 34, 447 m east-southeast of Feature 44, and 162 m northwest of Feature 40. Maywand District, Kandahar Province.

*Description:* This feature is an oval mound measuring apx. 16 m by 23 m. There are no signs of mud-brick remain on the surface.

*Image:*



*Contour lines:*



(orthoimagery courtesy of USAGC, 2008; contours derived from Lidar data from USAGE 2008).

*Dates:* May date as early as the Neolithic period.

*Comparative features:* None.

### **Feature 43 (Mound: modern reuse)**

*Location:* Situated apx. 1.23 km southwest of Mazra Village. Feature 43 is apx. 365 m southeast of Feature 44 and 454 m west-southwest of Feature 40. Maywand District, Kandahar Province.

*Description:* This feature is a mound—it is not clear whether it is square or round—and measures apx. 73 m by 74 m. There appears to be a depression or possible water retention pool on the surface of the feature.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Neolithic period.

*Comparative features:* None.

## Feature 44 (Mound)

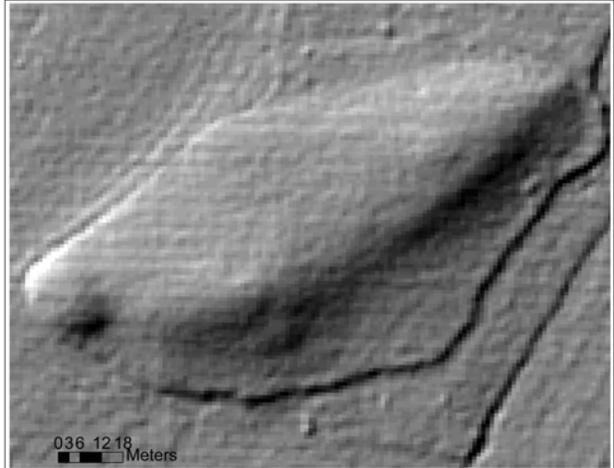
*Location:* Situated apx. 1 km southwest of Mazra Village. Feature 44 is situated apx. 447 m west-northwest of Feature 42, 555 m east-southeast of Feature 45, and 365 m northwest of Feature 43. Maywand District, Kandahar Province.

*Description:* This feature is an oval mound measuring apx. 143 m by 73 m; however the feature measures slightly smaller in the hillshade model measuring apx. 138 m by 51 m.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* May date as early as the Neolithic period.

*Comparative features:* None.

## Feature 45 (Mound)

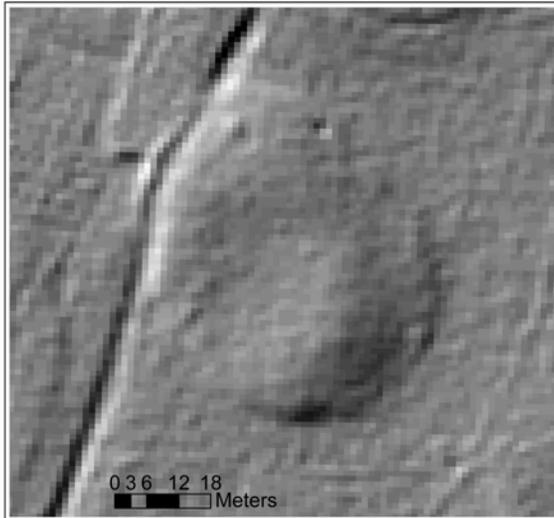
*Location:* Situated apx. 1.5 km southwest of Mazra Village and apx. 2.14 km northwest of Chehel Gazi. Feature 45 is apx. 555 m west-northwest of Feature 44 and apx. 151 m northeast of Feature 46. Maywand District, Kandahar Province.

*Description:* This feature is an oval mound (43 m by 64 m). The feature appears faint on the landscape in the orthoimagery but is clearly visible in the hillshade model.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Neolithic period.

*Comparative features:* None.

## Feature 46 (Tepe)

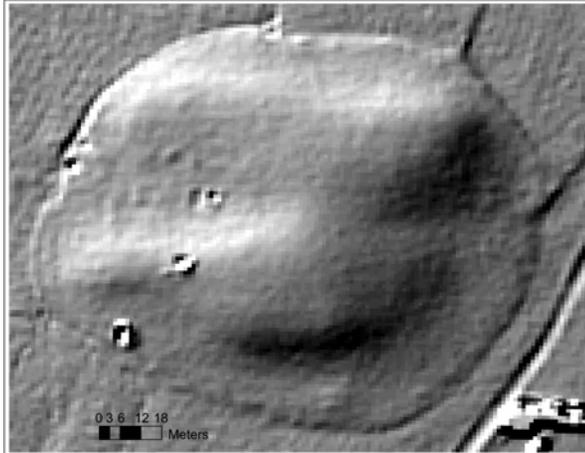
*Location:* Situated apx. 1.65 km southwest of Mazra Village and 2.8 km northwest of Chehel Gazi Village. Feature 46 is situated apx. 151 m southwest of Feature 45 and 391 m northeast of Feature 47. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound (120 m by 114 m) and shows signs of having mud-brick remains on the surface. This feature may be part of a larger archaeological complex.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* The mound may date as early as the Neolithic period. The mud-brick remains may date as early as the Medieval or Historic Periods.

*Comparative features:* None.

## Feature 47 (Mound)

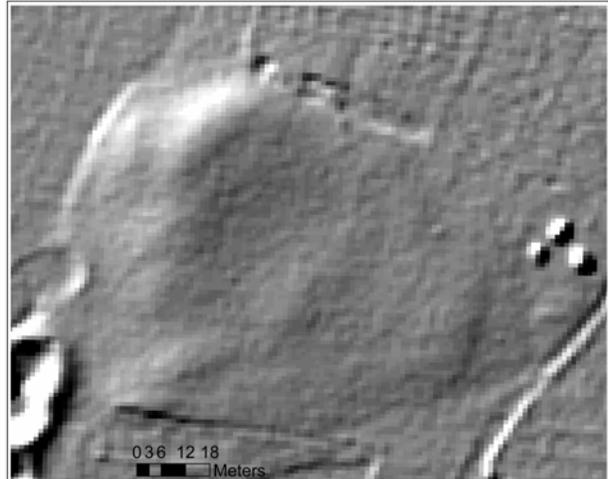
*Location:* Situated apx. 1.82 km southeast of Capoza'i and apx. 2.8 km west-northwest of Chehel Gazi Village. Feature 47 is situated apx. 913 m west of Feature 43 and 391 m southwest of Feature 46. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound (96 m by 89 m). This feature may be part of a larger archaeological complex. Further, the feature appears faint on the landscape in the orthoimagery but is clearly visible in the hillshade model.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Neolithic period.

*Comparative features:* None.

## Feature 48 (Mound)

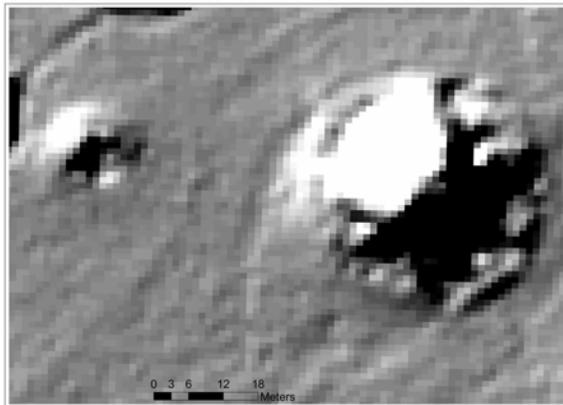
*Location:* Situated apx. 987 m northeast of Maku Village and 1.31 km northwest of Baba Ali. This feature is apx. 124 m north of Feature 52 and 200 m northwest of Feature 51. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 42 m by 40 m. This feature may be part of a larger complex. Features in close proximity include Feature 49, Feature 50, Feature 51, Feature 52, Feature 53, Feature 54, Feature 55, Feature 56, Feature 57, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* May date as early as the Neolithic period.

*Comparative features:* None.

## Feature 49 (Mound)

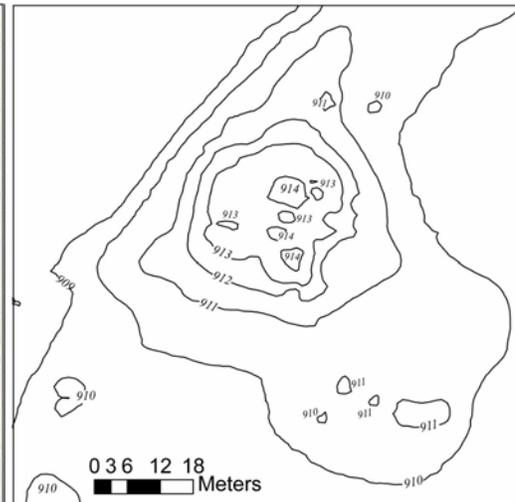
*Location:* Situated 795 m northeast of Maku Village and 1.04 km northwest of Baba Ali. This feature is 93 m north of Feature 50 and 143 m south of Feature 52. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound (30 m by 27 m). This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 50, Feature 51, Feature 52, Feature 53, Feature 54, Feature 55, Feature 56, Feature 57, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*Contour lines:*



(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).

*Dates:* May date as early as the Neolithic period.

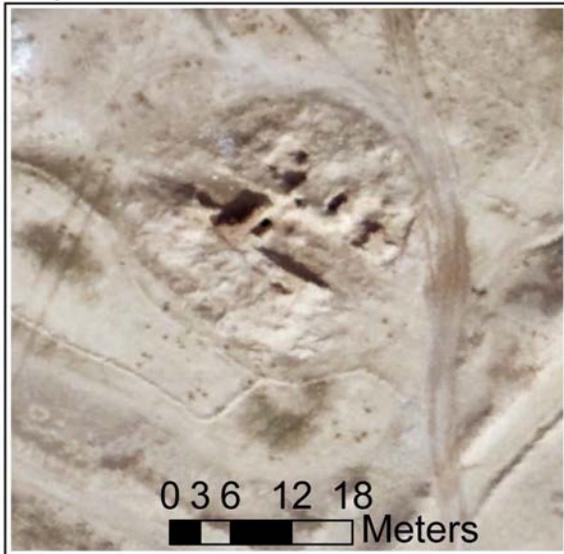
*Comparative features:* None.

## Feature 50 (Tepe)

*Location:* Situated apx. 740 m northeast of Maku Village and 958 m northwest of Baba Ali. This feature is 93 m south of Feature 49. Maywand District, Kandahar Province.

*Description:* This feature is a *tepe* measuring apx. 23m by 23 m. This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 51, Feature 52, Feature 53, Feature 54, Feature 55, Feature 56, Feature 57, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Neolithic period.

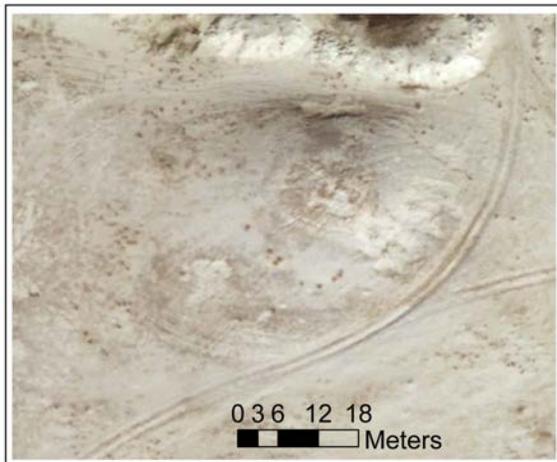
*Comparative features:* None.

## Feature 51 (Mound)

*Location:* Situated apx. 984 m northeast of Maku Village and 1.4 km northwest of Baba Ali. This feature is apx. 150 m east of Feature 52 and 189 m northeast of Feature 42. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 39 m by 48 m. This feature appears faint on the landscape in the orthoimagery but is better viewed in the hillshade mode. This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 52, Feature 53, Feature 54, Feature 55, Feature 56, Feature 57, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Neolithic period.

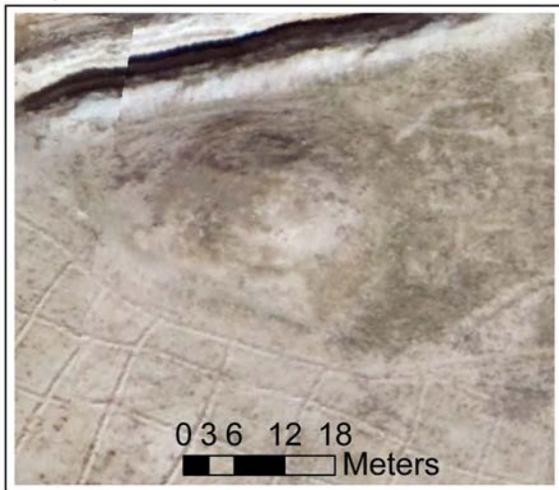
*Comparative features:* None.

## Feature 52 (Mound)

*Location:* Situated apx. 885 m northeast of Maku Village and 1.19 km northwest of Baba Ali. This feature is apx. 150 m west of Feature 51 and 144 m north of Feature 42. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 35 m by 27 m. This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 53, Feature 54, Feature 55, Feature 56, Feature 57, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Neolithic period.

*Comparative features:* None.

### **Feature 53 (Mound)**

*Location:* Situated apx. 789 m northwest of Baba Ali Village and 687 m northeast of Maku Village. Feature 53 is apx. 130 m east-northeast of Feature 54 and 116 m northeast of Feature 59. Maywand District, Kandahar Province.

*Description:* This feature is a mound measuring apx. 41 m by 40 m. It is possible that this feature is a tepe based on its slope that would have been created by many levels of occupation. It shows signs of disturbance on the surface but also, a karez runs in close proximity and encroaches on the feature. This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 52, Feature 54, Feature 55, Feature 56, Feature 57, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Neolithic period.

*Comparative features:* None.

## Feature 54 (Square/rectangular Feature)

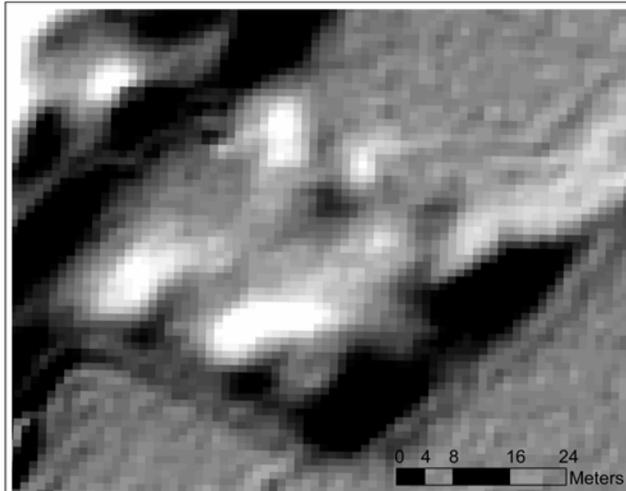
*Location:* Situated apx. 559 m northeast of Maku Village and 819 m northwest of Baba Ali Village. Feature 54 is apx. 130 m west-northwest of Feature 53 and 87 m northwest of Feature 59. Maywand District, Kandahar Province.

*Description:* This feature is square (47 m by 48 m) and may represent a qala or caravanserai. This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 52, Feature 53, Feature 55, Feature 56, Feature 57, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).*

*Dates:* May date as early as the Medieval or Historic period.

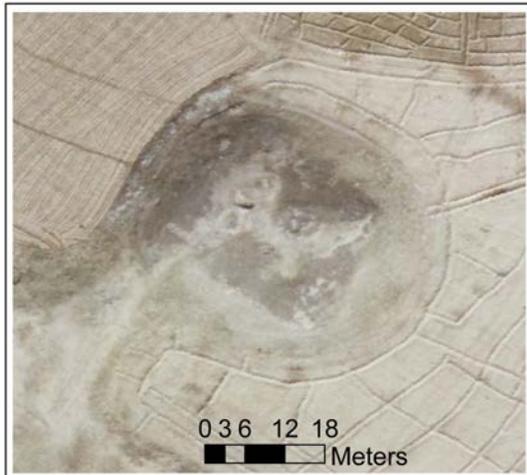
*Comparative features:* None.

## Feature 55 (Square/rectangular Feature)

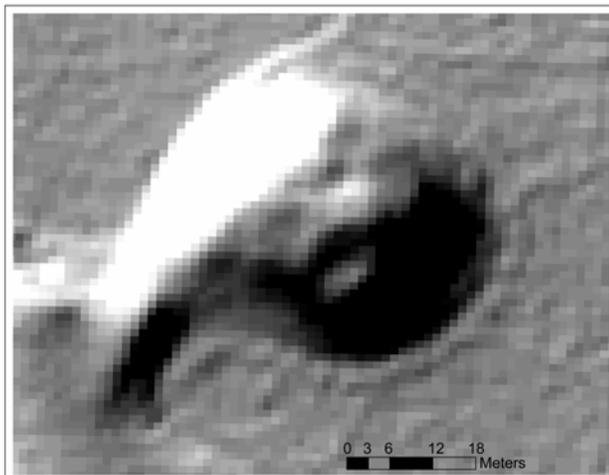
*Location:* Situated 442 m east-northeast of Maku Village and 822 m northwest of Baba Ali Village. Feature 55 is situated apx. 69 m northeast of Feature 56 and 158 m west of Feature 59. Maywand District, Kandahar Province.

*Description:* This feature is rectangular in shape (41 m by 34 m). This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 52, Feature 53, Feature 54, Feature 56, Feature 57, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*Hillshade model:*



(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGE 2008).

*Dates:* May date as early as the Medieval or Historic Periods.

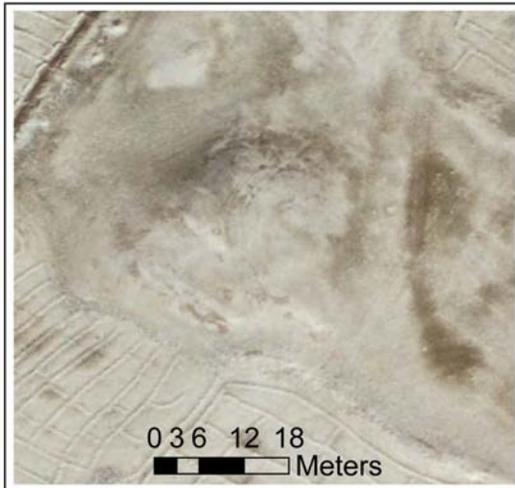
*Comparative features:* None.

## Feature 56 (Mound)

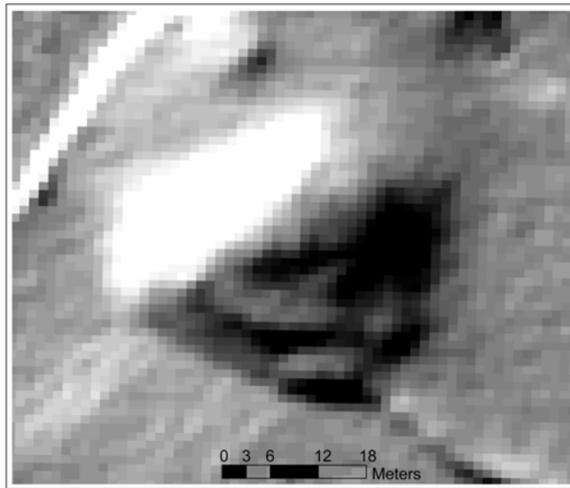
*Location:* Situated apx. 384 m west-northwest of Maku Village and apx. 812 m northwest of Baba Ali. Feature 56 is situated apx. 69 m southwest of Feature 55 and 58 m north of Feature 57. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound (33 m by 35 m). This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 52, Feature 53, Feature 54, Feature 55, Feature 57, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* This feature is a mound that appears to be part of a larger complex.

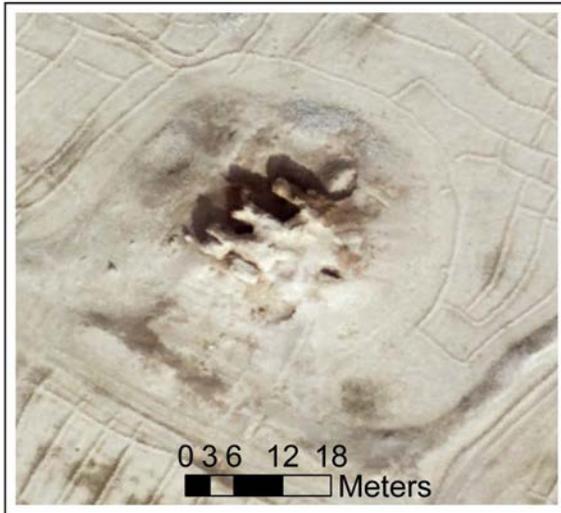
*Comparative features:* None.

## Feature 57 (Mound)

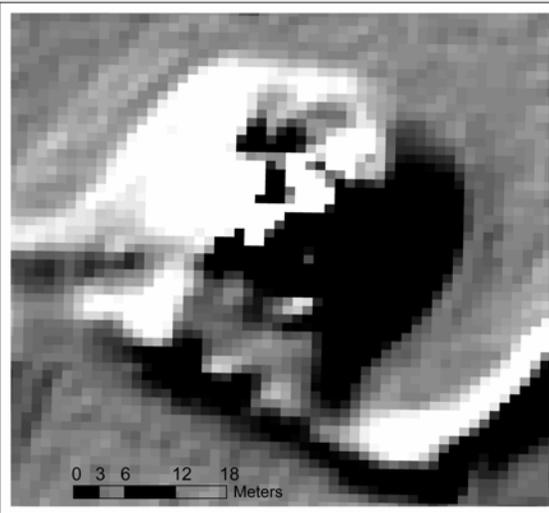
*Location:* Situated apx. 361 m east-northeast of Maku Village and 781 m northwest of Baba Ali. Feature 57 is situated apx. 242 m southwest of Feature 59 and 70 m north of Feature 60. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound (36 m by 34 m). This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 52, Feature 53, Feature 54, Feature 55, Feature 56, Feature 58, Feature 59, Feature 60, and Feature 61.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Neolithic Period.

*Comparative features:* None.

### **Feature 58 (Circumvallation Feature: circular)**

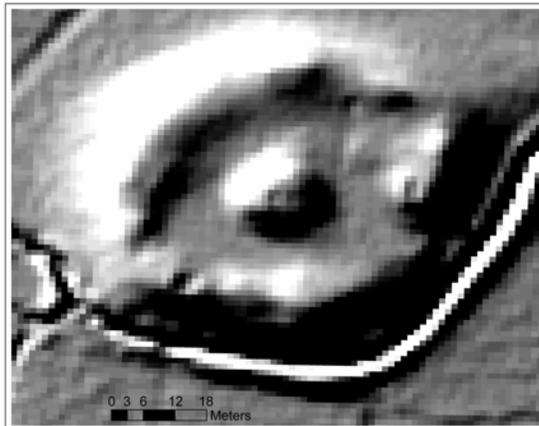
*Location:* Situated apx. 1.28 km east of Maku Village and 609 m northeast of Baba Ali Village. Feature 58 is situated apx. 674 m east-southeast of Feature 53 and 699 m east-northeast of Feature 61. Maywand District, Kandahar Province.

*Description:* This is a circular circumvallation feature (73 m by 66 m). It contains possible walls and a raised area in the center. This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 52, Feature 53, Feature 54, Feature 55, Feature 56, Feature 57, Feature 59, Feature 60, and Feature 61.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Medieval or Historical Periods.

*Comparative features:* None.

## Feature 59 (Mound)

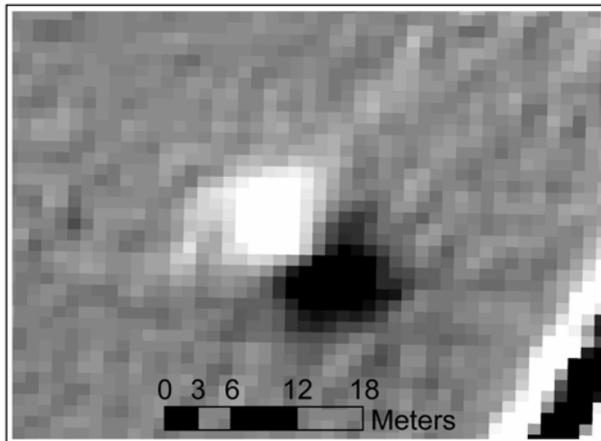
*Location:* Situated apx. 594 m east-southeast of Maku Village and 734 m northwest of Baba Ali Village. Feature 59 is located 87 m southeast of Feature 54 and 116 m southwest of Feature 53. Maywand District, Kandahar Province.

*Description:* This feature is a mound (18 m by 15 m). It is evident that the surrounding agricultural fields are encroaching on the feature. This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 52, Feature 53, Feature 54, Feature 55, Feature 56, Feature 57, Feature 58, Feature 60, and Feature 61.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Neolithic period.

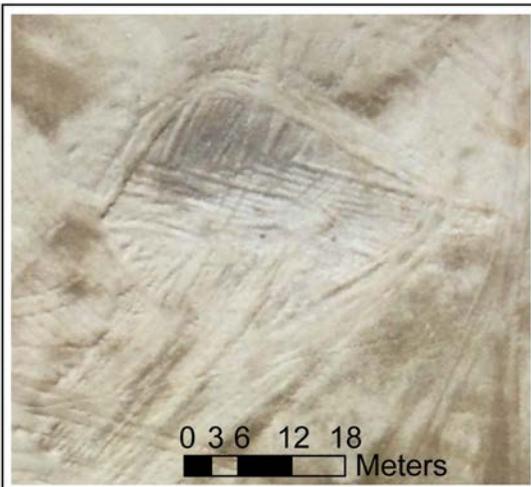
*Comparative features:* None.

## Feature 60 (Mound)

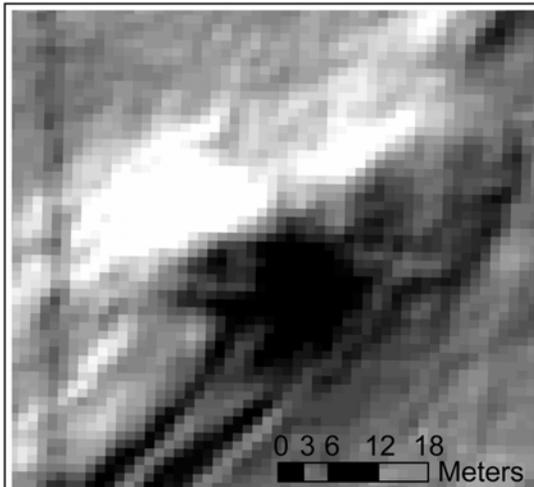
*Location:* Situated apx. 748 m northwest of Baba Ali Village and 345 m east of Maku Village. Feature 60 is situated apx. 311 m northwest of Feature 61 and 70 m south for Feature 57. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound (23 m by 27 m). It is evident that the surrounding agricultural fields are encroaching on this feature. This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 52, Feature 53, Feature 54, Feature 55, Feature 56, Feature 57, Feature 59, and Feature 61.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Neolithic period.

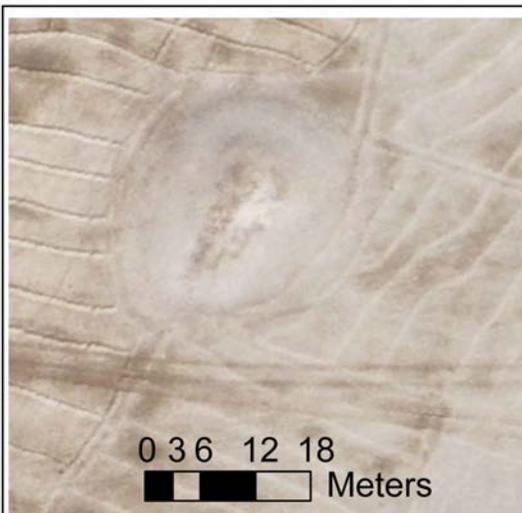
*Comparative features:* None.

## Feature 61 (Mound)

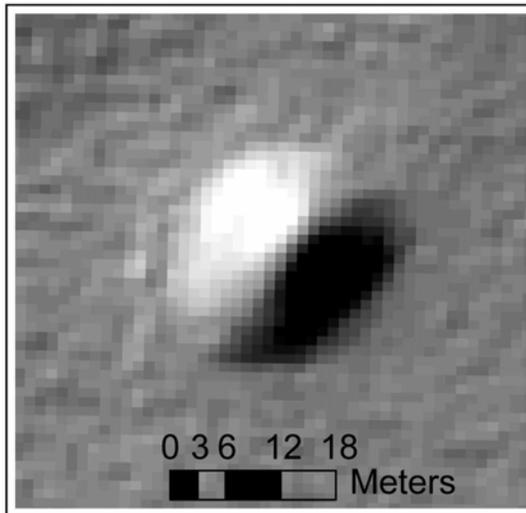
*Location:* Situated 439 m northwest of Baba Ali Village and 638 m east-southeast of Maku Village. Feature 61 is situated apx. 311 m southeast of Feature 60 and 347 m south of Feature 59. Maywand District, Kandahar Province.

*Description:* This feature is an oval mound measuring apx. 19 m by 25 m. This feature may be part of a larger complex. Features in close proximity include Feature 48, Feature 49, Feature 50, Feature 51, Feature 52, Feature 53, Feature 54, Feature 55, Feature 56, Feature 57, Feature 58, Feature 59, and Feature 60.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Neolithic period.

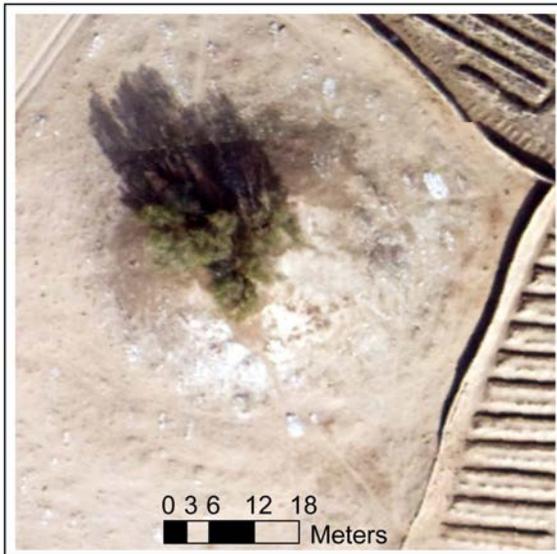
*Comparative features:* None.

### **Feature 62 (Mound: modern reuse)**

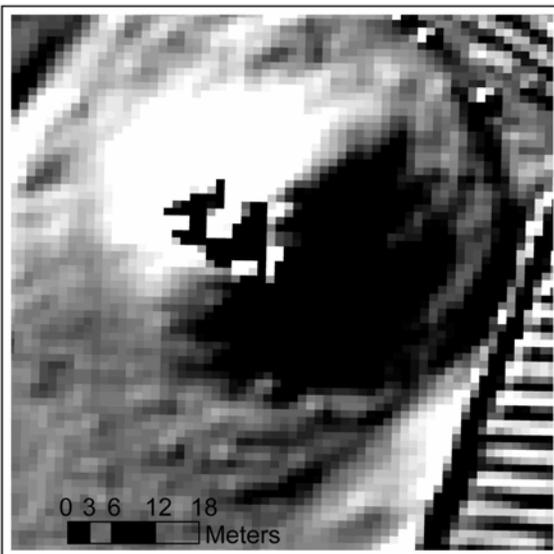
*Location:* Situated apx. 359 m northwest of Chehel Gazi Village and 1.61 km south of Murcha Village. Feature 62 is situated apx. 55 m southeast of Feature 63 and 945 m southeast of Feature 41. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 49 m by 41 m that has been reused as a cemetery. There is a tree growing on top of the mound.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* The mound may date as early as the Neolithic Period. The graves may date as early as the Medieval Islamic Period.

*Comparative features:* None.

### **Feature 63 (Mound: modern reuse)**

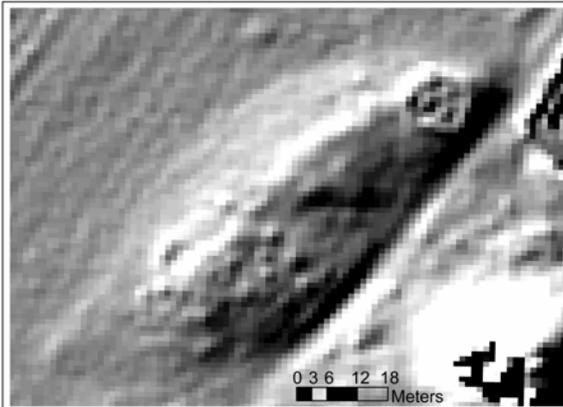
*Location:* Situated apx. 414 m northwest of Chehel Gazi and 1.57 km south of Murcha Village. Feature 63 is situated apx. 55 m northwest of Feature 62 and 890 m southeast of Feature 41. Maywand District, Kandahar Province.

*Description:* This feature is a raised cemetery measuring apx. 77 m by 39 m and may be larger than estimated. The raised area may be a mound, but it may also be part of the natural topography.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* The mound may date as early as the Neolithic Period. The graves may date as early as the Medieval Islamic Period.

*Comparative features:* None.

### **Feature 64 (Qala: Modern walls)**

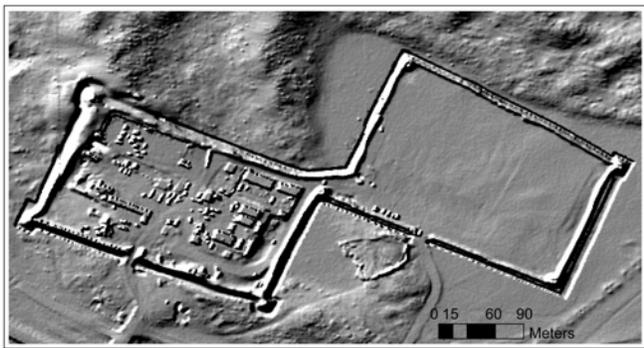
*Location:* Situated 1.9 km east of Khushkhaleq Village and 2.13 km southeast of Maywand Village. Feature 64 is situated apx. 1.1 km southwest of Feature 37 and 2.3 km southeast of Maywand Village. Maywand District, Kandahar Province.

*Description:* This feature is categorized as walls (485 m by 309 m) and may be a modern construction since there are modern buildings inside of the walls. However, if modern, the architectural style represents a continuation of the architecture of qalas.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* Modern.

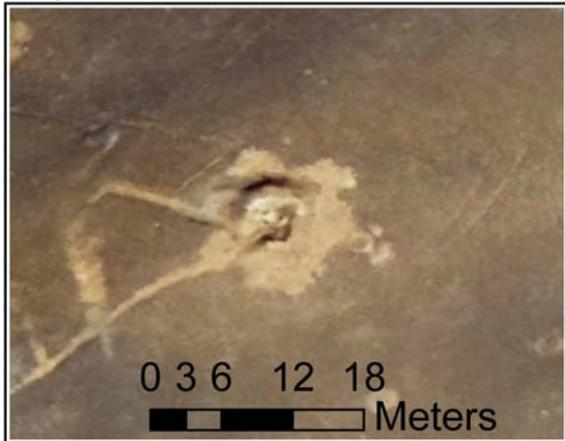
*Comparative features:* None.

### **Feature 65 (Undetermined structure)**

*Location:* Situated apx. 6.6 km east of Khushkhaleq Village and 6.7 km southeast of Maywand Village. Feature 65 is situated apx. 32 m southeast of Feature 67 and 52 m northwest of Feature 66. Maywand District, Kandahar Province.

*Description:* This feature is an undetermined structure (4.5 m by 4.5 m) and it may be part of a larger archaeological site that includes Features 66 and 67 as evidenced by possible roads that connect the features.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

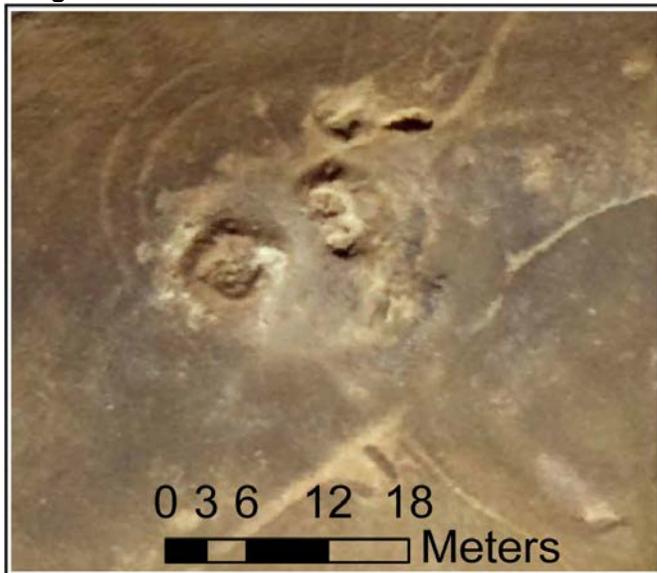
*Comparative features:* None.

### **Feature 66 (Undetermined structure)**

*Location:* Situated apx. 6.6 km east of Khushkhaleq Village and 6.7 km southeast of maywand Village. Feature 66 is situated 32 m southwest of Feature 67 and 52 m northeast of Feature 65. Maywand District, Kandahar Province.

*Description:* This a round feature as determined by the surrounding, discolored soil. The feature may be a raised area that contains two, possibly three, undetermined structures but whether the feature is raised cannot be determined in either the orthoimagery or the hillshade model. The area measure approximately (16 m by 16 m) and may be part of a larger archaeological site that includes Features 65 and 67.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

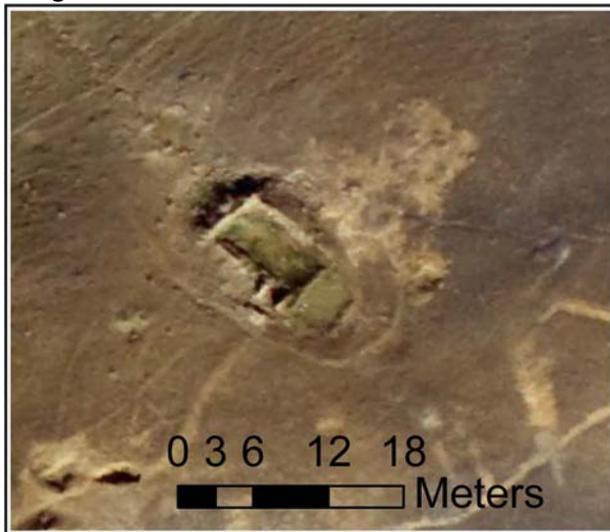
*Comparative features:* None.

### **Feature 67 (Undetermined structure)**

*Location:* Situated 6.6 km east of Khushkhaleq Village and 6.7 km southeast of Maywand Village. Situated apx. 32 m northeast of Feature 66 and 32 m northwest of Feature 65. Maywand District, Kandahar Province.

*Description:* This feature is an undetermined structure measuring apx. 12.5 m by 7 m; although, a larger oval area also appears to be demarcated by soil discoloration that may be result of a low wall measuring apx. 17.3 m by 11.7 m. This feature may be part of a larger archaeological site that includes Features 65 and 66.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods but could also be modern.

*Comparative features:* None.

### **Feature 68 (Undetermined: Qala?)**

*Location:* Situated apx. 7.6 km east of Khushkhaleq Village and 7.8 km southeast of Maywand Village. Feature 68 is situated apx. 1.16 km southeast of Feature 65, 1.19 km southeast of Feature 66, and 2.7 km northwest of Feature 85. Maywand District, Kandahar Province.

*Description:* This feature shows evidence of having been a qala (97 m by 100 m) but currently contains modern constructions and uses. Surrounding this feature, there are lots of scars and possibly ruined mud-brick constructions that maybe modern.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* Undetermined.

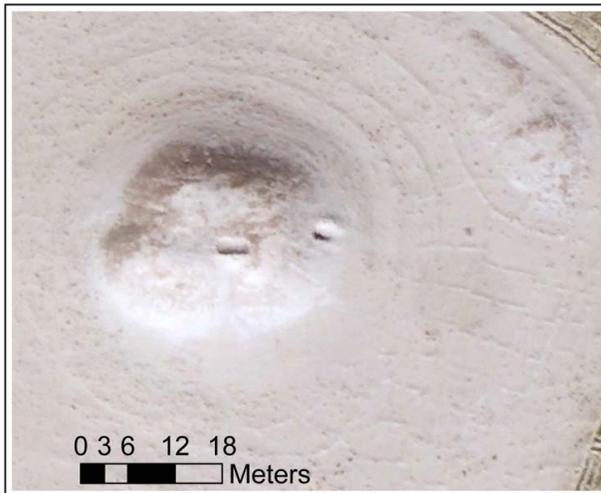
*Comparative features:* None.

## Feature 69 (Tepe)

*Location:* Situated apx. 1.15 km southeast of Hasnabad Village and 2.42 km east-northeast of Kariz Shahbozurg Village. Feature 69 is situated apx. 1.81 km northeast of Feature 96 and 2.3 km southwest of Feature 64. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 26 m by 24 m. and contains the remains of mud-brick structures on the surface.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* The mound may date as early as the Neolithic. The structures may date as early as the Medieval or Historic Periods.

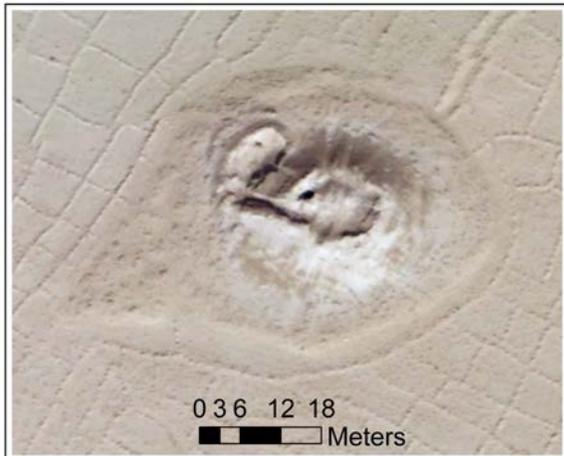
*Comparative features:* None.

## Feature 70 (Tepe)

*Location:* Situated apx. 1.09 km northeast of Kariz Shahbozurg and 2.3 km southwest of Hasnabad. Feature 70 is situated apx. 123 m northeast of Feature 94 and 95 m north-northeast of Feature 93. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound (41 m by 40 m) with evidence of mud-brick remains on the surface. That may be part of a larger archaeological complex.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* The mound may date as early as the Neolithic. The structures may date as early as the Medieval or Historic Periods.

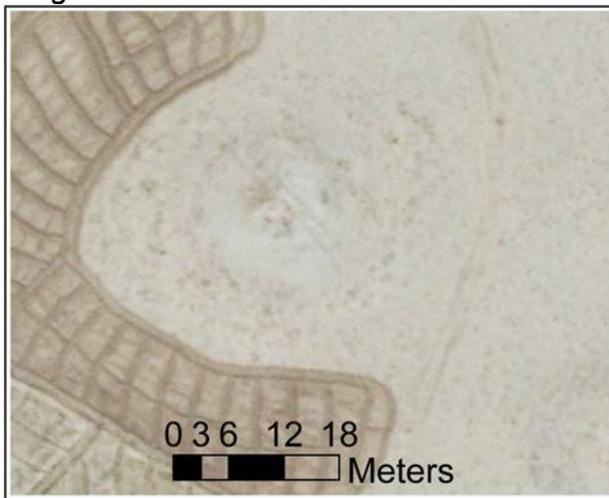
*Comparative features:* None.

## Feature 71 (Mound)

*Location:* Situated apx. 3 km southeast of Kariz Shahbozurg Village and 846 m west-southwest of Khodaydad Akhundzadah Kariz Village. Feature 71 is situated apx. 582 m south of Feature 102 and 1.17 m southwest of Feature 71. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound that measures apx. 30 m by 29 m. The hillshade model suggests that there is a raised area in the center of the mound that may indicate that this mound is actually a tepe. It is evident that the surrounding agricultural fields are encroaching on the feature.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Neolithic.

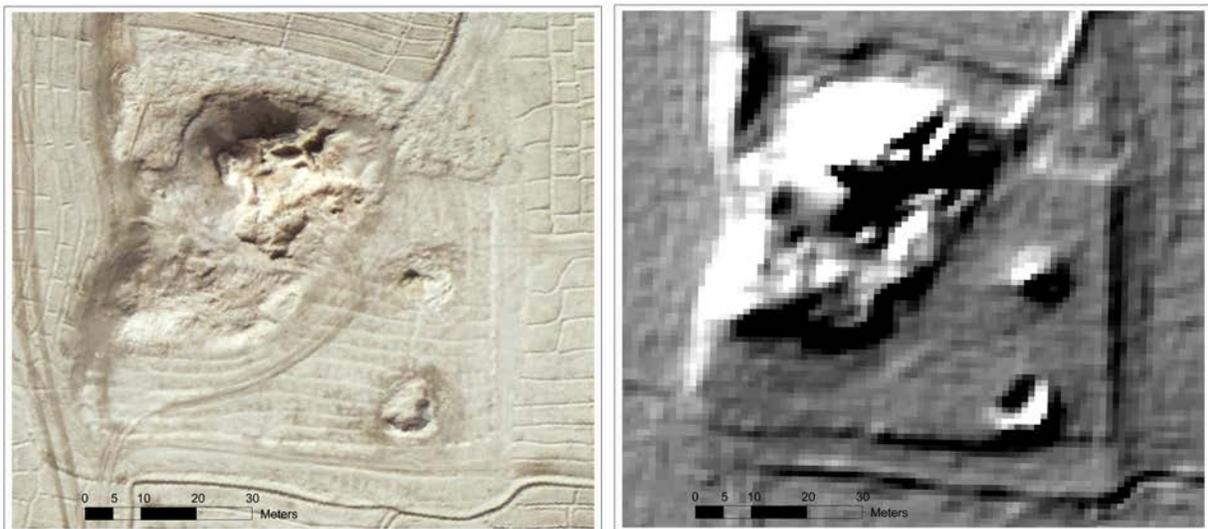
*Comparative features:* None.

## Feature 72 (Undetermined structure)

*Location:* Situated apx. 342 m west of Shukor Kalay Village and apx. 758 m southeast of Landi Kariz Kalay. Feature 72 is situated apx. 741 m southeast of Feature 98 and 983 m northeast of Feature 75. Maywand District, Kandahar Province.

*Description:* This feature is an undetermined structure of an indeterminable shape. The raised area directly associate with the structure is oval and measures apx. 55 m by 34 m. An examination of the hillshade model suggests that this structure may be situated on top of a larger raised square area that measures apx. 62 m by 63 m., although, the orthoimagery shows evidence of agricultural fields in this larger area. As a result, this larger square area may be a result of the way the surrounding agricultural fields are organized and constructed and encroaching on the oval raised area.

*Image:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Medieval or Historic Period.

*Comparative features:* None.

### **Feature 73 (Unidentified Structure: C)**

*Location:* Situated apx. 1.4 km southwest of Landi Kariz Kalay and apx. 1.86 km west of Shukor Kalay. Feature 73 is situated apx. 208 m northwest of Feature 96 and 1.24 km southwest of Feature 98. Maywand District, Kandahar Province.

*Description:* This feature is an unknown structure (45.6 m. by 38 m.) that appears to contain a well.<sup>115</sup> There are six similar features that include Features 36a 74, 75, 83, 89, and 91.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

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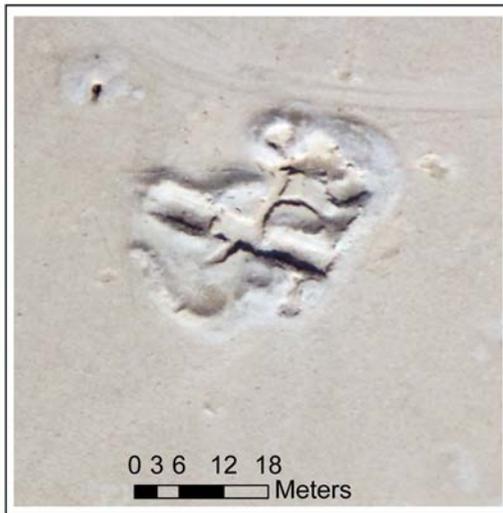
<sup>115</sup> The measurement of the feature was determined by measuring from the outer side of the well to the furthest side of the structure.

### **Feature 74 (Unidentified Structure: C)**

*Location:* Situated apx. 601 m southeast of Byabanak Village, 1.79 km southwest of Baba Ali, and 756 m northwest of Feature 73. Maywand District, Kandahar Province.

*Description:* This feature is an unknown structure (38.7 m by 33.2 m) that appears to contain a well.<sup>116</sup> There are six similar features that include Features 36a, 73, 75, 83, 89, and 91

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

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<sup>116</sup> The measurement of the feature was determined by measuring from the outer side of the well to the furthest side of the structure.

### **Feature 75 (Unidentified Structure: C)**

*Location:* Situated apx. 1.25 km southwest of Landi Kariz Kalay Village and apx. 1.3 km southwest of Shukor Kalay Village. Feature 74 is situated apx. 1.11 km southwest of Feature 98 and apx. 546 m southeast of Feature 96. Maywand District, Kandahar Province.

*Description:* This feature is an unknown structure (32 m by 35 m) that appears to contain a well.<sup>117</sup> It also appears to be two scars that are also associated with this feature. One scar is situated to the north and the other to the south of the unidentified structure. There are six similar features that include Features 36a, 73, 74, 83, 89, and 91

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

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<sup>117</sup> The measurement of the feature was determined by measuring from the outer side of the well to the furthest side of the structure. This measurement also contains the two scars that are located to the north and south of the unique structure.

### **Feature 76 (Circumvallation Feature: circular)**

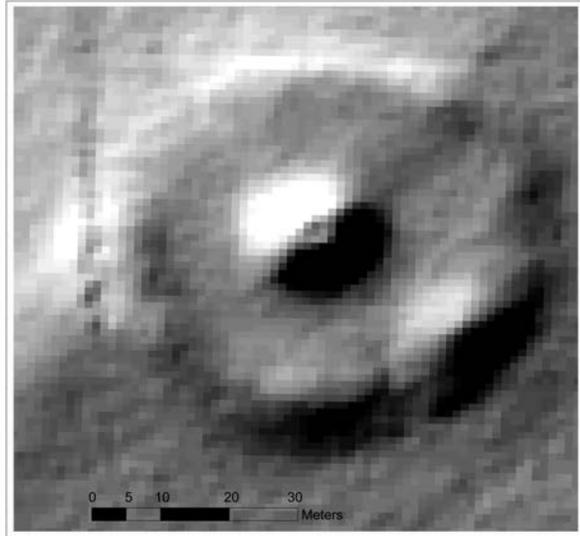
*Location:* Situated apx. 1.18 km southwest of Khodaydad Akhundzadah Kariz Village and 541 m south of Nawabad Village. Feature 76 is situated apx. 857 m east of Feature 91 and 517 m northwest of Feature 97. Maywand District, Kandahar Province.

*Description:* This feature is a circular circumvallation feature (54 m by 54 m) evidenced by a raised area in the center surrounded by a possible wall.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:*

## Feature 77 (Square/rectangular Feature)

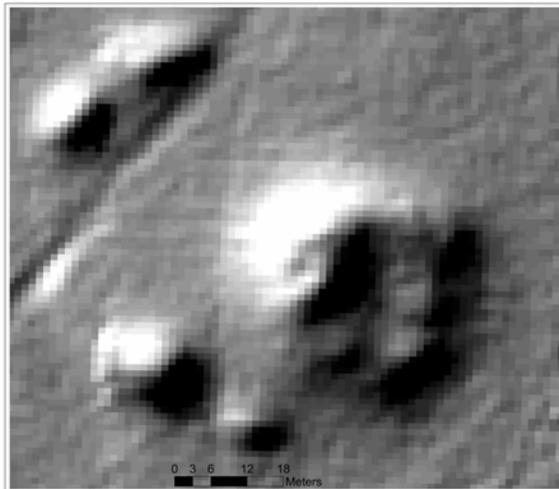
*Location:* Situated apx. 991 m southeast of Nawabad Village and 499 m southwest of Khodaydad Akhundzadah Kariz Village. Feature 77 is situated apx. 98 m southeast of Feature 99 and 104 m northeast of Feature 73. Maywand District, Kandahar Province.

*Description:* This feature is a square feature (34 m by 32 m). This feature may be part of a larger complex. Features in close proximity include Feature 78, Feature 79, and Feature 99.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Medieval and Historic Periods.

*Comparative features:* None.

## Feature 78 (Mound)

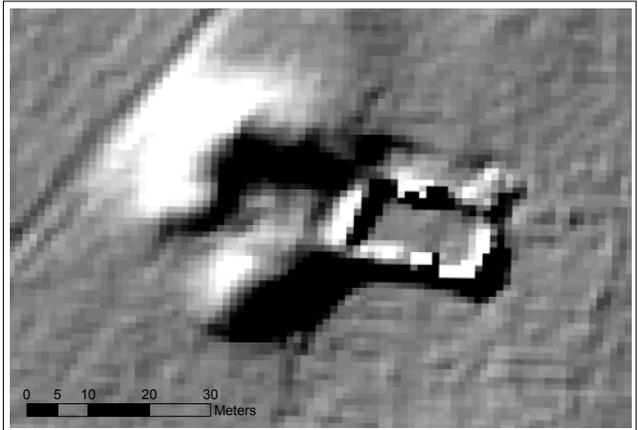
*Location:* Situated apx. 597 m southwest of Khodaydad Akhundzadah Kariz Village and 980 m southeast of Nawabad Village. Feature 78 is situated apx. 110 m northeast of Feature 79 and 104 m southwest of Feature 77. Maywand District, Kandahar Province.

*Description:* This feature is a square mound measuring apx 53 m by 40 m. This feature may be part of a larger complex. Features in close proximity include Feature 77, Feature 79, and Feature 99.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Medieval and Historic Periods.

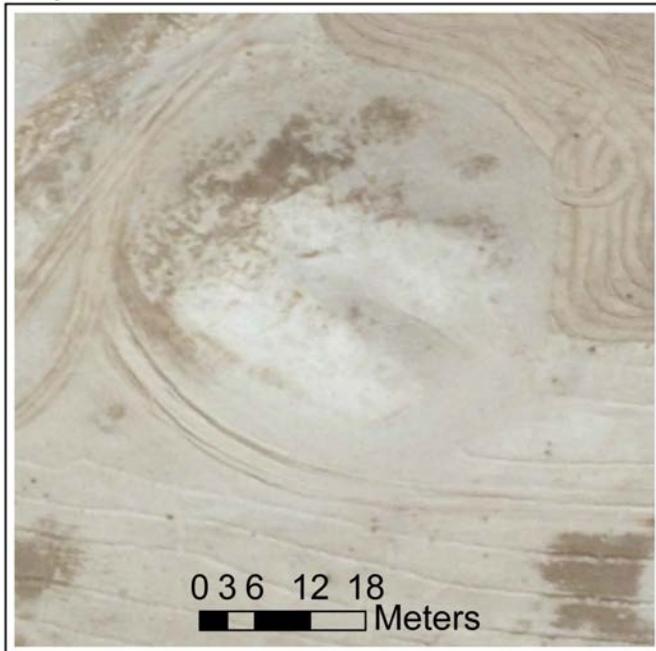
*Comparative features:* None.

### **Feature 79 (Square/rectangular Feature)**

*Location:* Situated apx. 707 m southwest of Khodaydad Akhundzadah Kariz Village and 1.01 km southeast of Nawabad Village. Feature 79 is situated apx. 110 m southwest of Feature 78 and 807 m east of Feature 76. Maywand District, Kandahar Province.

*Description:* This feature is a rectangular feature (39 m by 42 m). This feature may be part of a larger complex. Features in close proximity include Feature 77, Feature 78, and Feature 99.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

### **Feature 80 (Undetermined structure)**

*Location:* Situated 5.57 km east of Sarwar Kariz. Feature 80 is situated apx. 1.47 km east of Feature 84 and 164 m northwest of Feature 81. Maywand District, Kandahar Province.

*Description:* This feature is an undetermined square structure measuring apx. 23 m by 23 m that may have a well associated with it.<sup>118</sup>

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

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<sup>118</sup> It is unclear whether there is a well that is visible in the left of the image. If it is a well, it is situated at a distance of apx. 24 m from the structure.

### **Feature 81 (Scars: Undetermined)**

*Location:* Situated apx. 5.7 km east of Sarwar Karez Village. Feature 81 is situated apx. 164 m northwest of Feature 80 and 82 m northeast of Feature 82. Maywand District, Kandahar Province.

*Description:* This feature is a series of “scars” on the landscape that may represent low or short walls from associated with tents. See Feature 3 for an in depth discussion of these types of features.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* Undetermined.

*Comparative features:* None.

## Feature 82 (Scars: Undetermined)

*Location:* Situated apx. 5.65 km east of Sarwar Kariz Village. Feature 82 is situated apx. 1.61 km east-southeast of Feature 84, 1.01 km northeast of Feature 87, and 82 m southwest of Feature 81. Maywand District, Kandahar Province.

*Description:* This feature is a series of “scars” on the landscape that may represent low or short walls from associated with tents. See Feature 3 for an in depth discussion of these types of features.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* Undetermined.

*Comparative features:* None.

### **Feature 83 (Unidentified Structure: C)**

*Location:* Situated apx. 1.11 km south of Nawabad Village and 1.57 km southwest of Khodaydad Akhundzadah Kariz Village. Feature 83 is situated apx. 177 m southeast of Feature 97 and 972 m southwest of Feature 79. Maywand District, Kandahar Province.

*Description:* This feature is an unknown structure measuring 54 m by 24 m that may contain a well.<sup>119</sup> There are six similar features in the study area that include Features 36a, 73, 74, 75, 89, and 91.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

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<sup>119</sup> The measurement of the feature was determined by measuring from the outer side of the well to the furthest side of the structure.

### Feature 84 (Circumvallation Feature: Square)

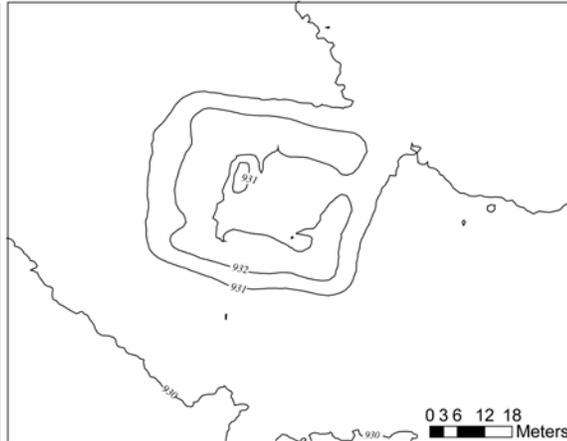
*Location:* Situated apx. 4.24 km east-northeast of Sarwar Karez Village. Feature 84 is situated apx. 3.76 km west of Feature 96, 1.47 km west of Feature 80, and 1.46 km southeast of Feature 87. Maywand District, Kandahar Province.

*Description:* This feature is a square circumvallation feature (39 m by 35 m). It is possible that this feature could also be a qala or caravanserai.

*Image:*



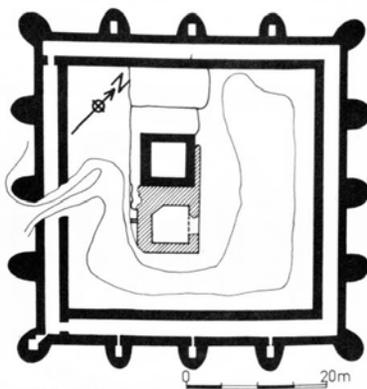
*Contour lines:*



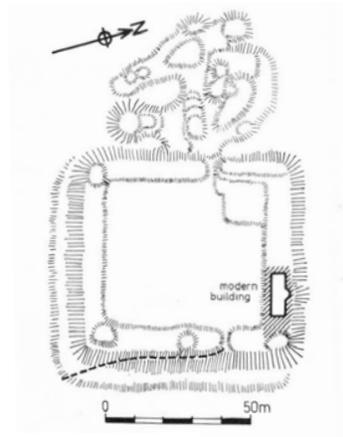
*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* This feature resembles the site of Cham Qala (Ball 1982:430) and Cham Qala (Ball 1982:430).

*Comparative images:*



MUG QAL'A  
(Ball 1982: 456)



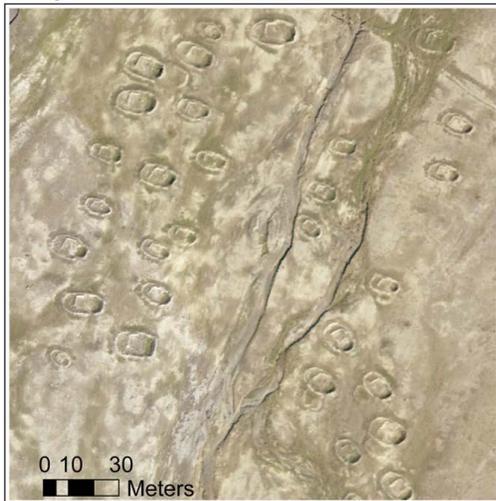
CHAM QAL'A  
(Ball 1982: 430)

## Feature 85 (Scars: Nomadic or Semi-sedentary Encampment)

*Location:* Situated apx. 8.7 km east of Sarwar Kariz Village. Feature 85 is situated apx. 3.02 km east of Feature 82, 3 km east of Feature 81, and 2.7 km southeast of Feature 68. Maywand District, Kandahar Province.

*Description:* This feature is a series of “scars” on the landscape that may represent low or short walls from associated with tents. See Feature 3 for an in depth discussion of these types of features.

*Image:*

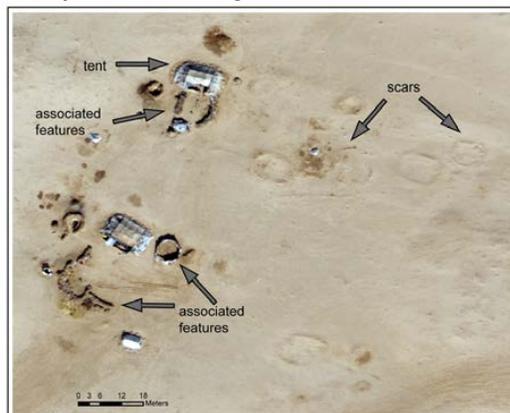


*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* Undetermined.

*Comparative features:* Similar features within the Maywand study are include Features 3, 6, 7, 15, 16, 25, 36, and 104.

*Comparative mage:*



*(orthoimagery courtesy of USAGC, 2008).*

## Feature 86 (Tepe)

*Location:* Situated apx. 572 m northeast of Sarwar Kariz Village and 1.2 km east-southeast of Loy Kariz Village. Feature 86 is situated apx. 1.81 km southwest of Feature 69 and 1.22 km east of Feature 88. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound (29 m by 32 m) that contains mud-brick remains on top.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* The mound may date as early as the Neolithic. The mud-brick structures may date as early as the Medieval or Historic Periods.

*Comparative features:* None.

### **Feature 87 (Undetermined structure)**

*Location:* Situated apx. 4.9 km east of Sarwar Kariz Village. Feaure 87 is situated apx. 1.46 km northwest of Feature 84 and 1.01 km southeast of Feature 82. Maywand District, Kandahar Province.

*Description:* This feature is a large rectangular structure measuring 40 m by 21 m.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

### **Feature 88 (Tepe)**

*Location:* Situated apx. 826 m west-northwest of Sarwar Kariz Village and 762 m south of Loy Kariz Village. Feature 88 is situated apx. 1.22 km west of Feature 86 and 2.4 km southeast of Feature 93. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound (37 m by 35 m) that contains mud-brick remains on top. It is evident that the surrounding agricultural fields are encroaching on the feature.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* The mound may date as early as the Neolithic. The mud-brick structures may date as early as the Medieval or Historic Periods.

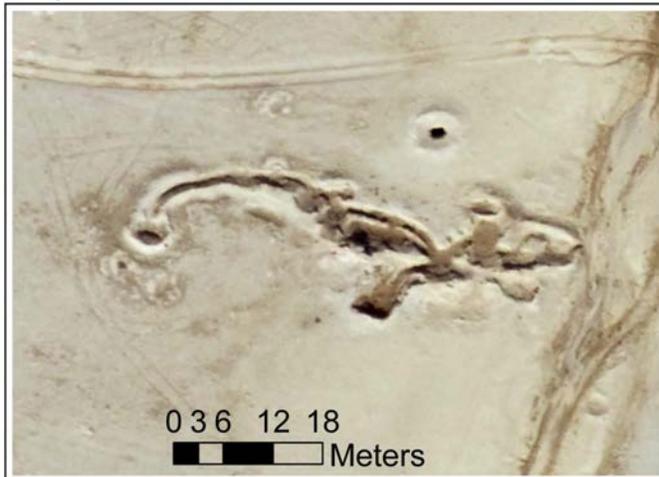
*Comparative features:* None.

### **Feature 89 (Unidentified Structure: C)**

*Location:* Situated apx. 2.9 km southwest of Kariz Shahbozurg and 2.5 km southwest of Khodaydad Akhundzadah Kariz Village. Feature 89 is situated apx. 586 m west of Feature 90 and 2.2 km southeast of Feature 79. Maywand District, Kandahar Province.

*Description:* This feature is an unknown structure (42 m by 26 m) that appears to have a well.<sup>120</sup> There are six similar features that include Features 36a, 73, 74, 75, 83, and 91.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None

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<sup>120</sup> The measurement of the feature was determined by measuring from the outer side of the well to the furthest side of the structure.

### Feature 90 (Undetermined structure)

*Location:* Situated apx. 2.12 km southwest of Khodaydad Akhundzadah Kariz Village and 3.6 km southwest of Kariz Shahbozurg Village. Feature 90 is situated apx. 586 m east of Feature 89 and 1.7 km southeast of Feature 79. Maywand District, Kandahar Province.

*Description:* This feature is an undetermined structure (46 m by 33 m). There appears to be a well associated with the structure.<sup>121</sup> The well is located at a distance of 19 m from the structure. Similar features that include Features 73, 74, 75, 83, 89, 91

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

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<sup>121</sup> The well was not included in the size of the structure.

### Feature 91 (Unidentified Structure: C)

*Location:* Situated apx. 1.21 km southwest of Nawabad Village and 944 m southwest of Shukor Kalay Village. Feature 91 is situated apx. 1.02 km southeast of Feature 75 and 788 m northwest of Feature 97. Maywand District, Kandahar Province.

*Description:* This feature is an unknown structure (61 m by 37 m).<sup>122</sup> There seems to be a well that is associated with this structure, although, unlike the other similar structures this well is located in agricultural fields. As a result, it is unclear whether this well is directly associated with this unidentified structure. There are six similar features that include Features 36a, 73, 74, 75, 83, and 89.

*Image:*



(orthoimagery courtesy of USAGC, 2008).

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

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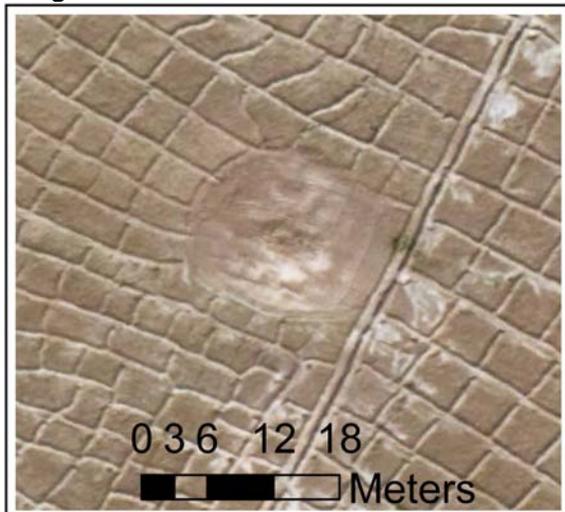
<sup>122</sup> The measurement of the feature was determined by measuring from the outer side of the well to the furthest side of the structure.

## Feature 92 (Mound)

*Location:* Situated apx. 1.34 km northwest of Chehel Gazi Village and 997 m south of Mazra Village. Feature 92 is situated apx. 178 m east-southeast of Feature 39 and 73 m southwest of Feature 41. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx 16 m by 15 m. It is evident that the surrounding agricultural fields are encroaching on this feature.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Neolithic Period.

*Comparative features:* None.

## Feature 93 (Mound)

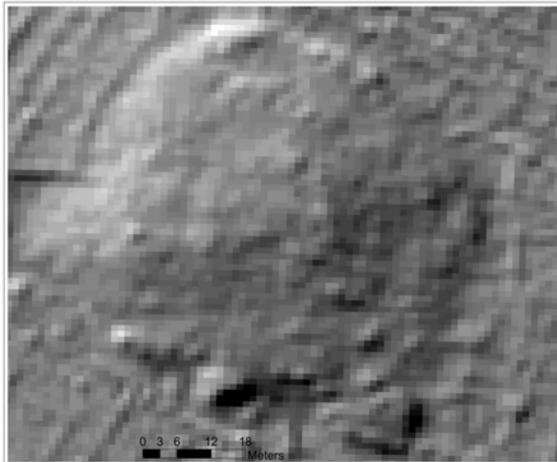
*Location:* Situated apx. 1.04 km northwest of Kariz Shahbozurg and 1.61 km southwest of Chehel Gazi. Feature 93 is situated apx. 95 km southwest of Feature 70 and 50 m east of Feature 94. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 65 m by 65 m and it may be part of a larger archaeological complex that includes Feature 94 and possibly Feature 70 and Feature 95. It is evident that the agricultural fields are encroaching on this feature.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Neolithic Period.

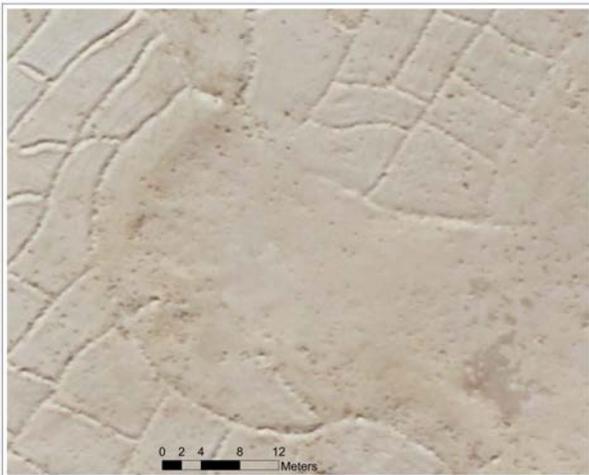
*Comparative features:* None.

## Feature 94 (Mound)

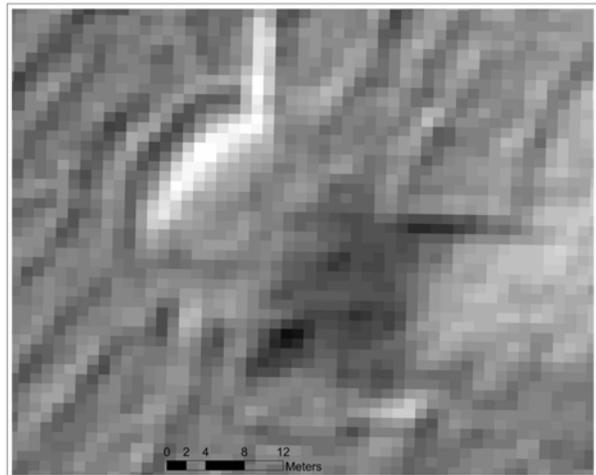
*Location:* Situated apx. 1.63 km southwest of Chehel Gazi and 1.08 km northwest of Kariz Shahbozurg. Feature 94 is situated apx. 114 m northeast of Feature 95 and 50 m west of Feature 93. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 24 m by 24 m and it may be part of a larger archaeological complex that includes Feature 93 and possibly Feature 70 and Feature 95. It is evident that the agricultural fields are encroaching on this feature.

*Image:*



*Hillshade model:*



(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).

*Dates:* May date as early as the Neolithic Period.

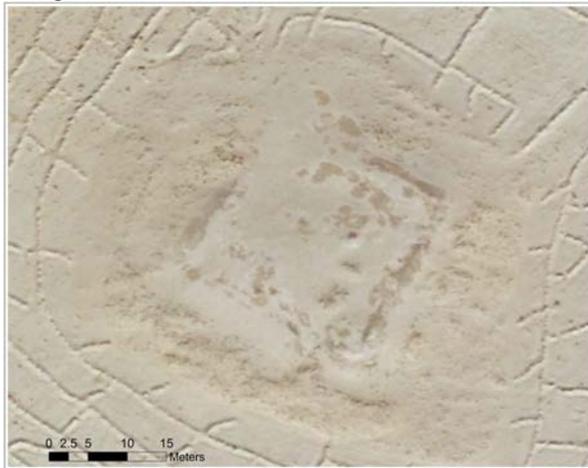
*Comparative features:* None.

## Feature 95 (Circumvallation Feature: square)

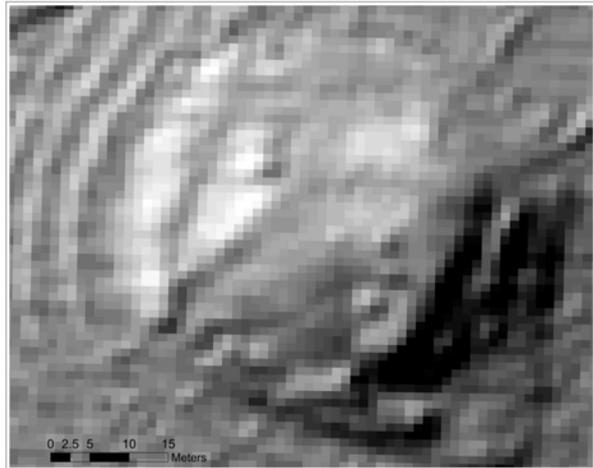
*Location:* Situated apx. 1.1 km northwest of Kariz Shahbozurg and 1.7 km southwest of Chehel Gazi. Feature 95 is situated apx. 114 m southwest of Feature 94 and 157 m southwest of Feature 93. Maywand District, Kandahar Province.

*Description:* This feature is a square circumvallation feature (53 m by 48 m) and it may be part of a larger archaeological complex that may include Features 92, 93, and 94. An examination of the hillshade model suggests that this feature is a round mound or possibly built on a raised area. This could also be the result of erosion. It is evident that the surrounding agricultural fields are encroaching on this feature.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

**Feature 96 (Circumvallation Feature: circular)**

*Location:* Situated apx. 1.21 km east-southeast of Loy Kariz and 573 m northeast of Sarwar Kariz. Feature 96 is situated apx. 1.81 km southwest of Feature 69 and 3.76 km east of Feature 84. Maywand District, Kandahar Province.

*Description:* This feature is circular circumvallation feature (45 m by 51 m).

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:* None.

### **Feature 97 (Mound)**

*Location:* Situated apx. 1.04 km southwest of Nawabad Village and 1.34 km southeast of Shukor Kalay Village. Feature 97 is situated apx. 177 m northwest of Feature 83 and 517 m southwest of Feature 76. Maywand District, Kandahar Province.

*Description:* This feature is a mound that measures apx. 64 m by 75 m.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Neolithic Period.

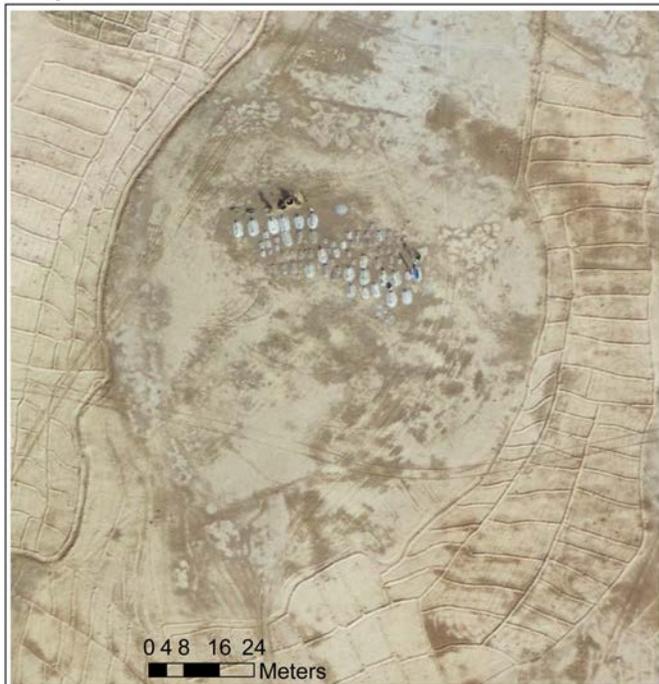
*Comparative features:* None.

### **Feature 98 (Mound: modern reuse)**

*Location:* Situated apx. 154 m northeast of Landi Kariz Kalay Village and 741 m northwest of Feature 72 and 1.11 km northeast of Feature 75. Maywand District, Kandahar Province.

*Description:* This feature is a mound (86 m by 89 m). This feature is difficult to measure because there is no clear division to the northern and southern sides of the mound. It may be part of a natural rise.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* The mound may date as early as the Neolithic Period. The cemetery may date as early as the Medieval Islamic Period.

*Comparative features:* can be found on the Internet at Web addresses [http://www.icosphoto.net/kandahar\\_taliban\\_graveyard/iframe\\_2](http://www.icosphoto.net/kandahar_taliban_graveyard/iframe_2) and <http://framework.latimes.com/2011/01/28/afghanistanaerials/#/11>.

### **Feature 99 (Mound: modern reuse)**

*Location:* Situated apx. 428 m southwest of Khodaydad Akhundzadah Kariz Village and 916 m southeast of Nawabad Village. Feature 99 is situated apx. 98 m northwest of Feature 77 and 174 m northeast of Feature 78. Maywand District, Kandahar Province.

*Description:* This feature is a mound (60 m by 105 m). This feature is difficult to measure because it has no clear southern boundary. This mound has been reused for a cemetery. This feature may be part of a larger complex. Features in close proximity include Feature 77, Feature 78, and Feature 79.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* The mound may date as early as the Neolithic Period. The cemetery may date as early as the Medieval Islamic Period.

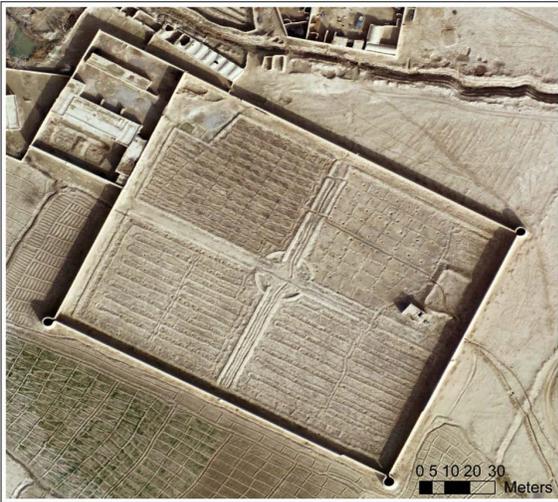
*Comparative features:* can be found on the Internet at Web addresses [http://www.icosphoto.net/kandahar\\_taliban\\_graveyard/iframe\\_2](http://www.icosphoto.net/kandahar_taliban_graveyard/iframe_2) and <http://framework.latimes.com/2011/01/28/afghanistanaerials/#/11>.

## Feature 100 (Qala)

*Location:* Situated apx. 458 northeast of Landi Kariz Kalay Village and 634 m east of Baba Ali. Feature 100 is situated apx. 612 m northeast of Feature 98 and 621 m southeast of Feature 58. Maywand District, Kandahar Province.

*Description:* This feature is a rectangular qala (131 m by 109 m) with three corner towers. It is used for agricultural activities or a garden or orchard. It is unclear whether the corner towers are operational. Corner towers help to stabilize tall walls (Hallet and Samizay 1980:129).

*Image:*



(orthoimagery courtesy of USAGC, 2008).

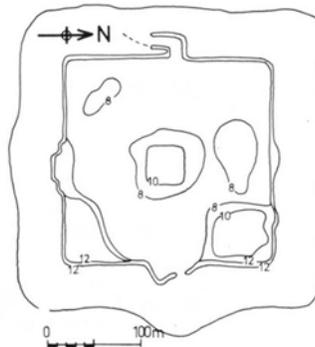
*Dates:* May be modern.

*Comparative features:* This feature resembles Jabar Tepe and Abu Huraira in style.

*Comparative images:*



JABAR TEPE  
(Ball 1982: 449)



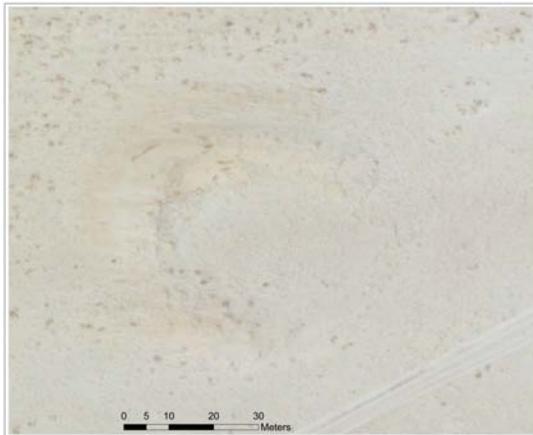
ABU HURAIRA  
(Ball 1982: 417)

### **Feature 101 (Mound)**

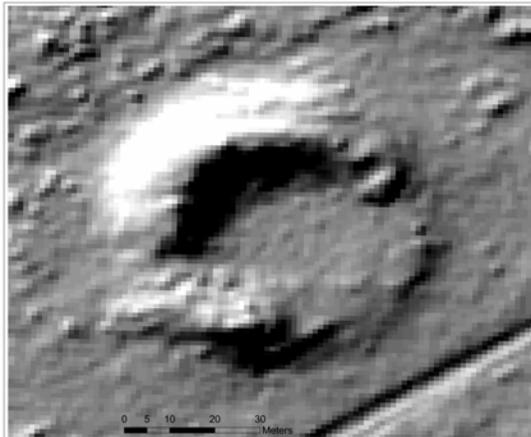
*Location:* Situated apx. 1.24 km northeast of Khodaydad Akhundzadah Kariz Village and 2.03 km northeast of Nawabad Village. Feature 101 is situated apx. 111 m northwest of Feature 103 and 189 m northwest of Feature 102. Maywand District, Kandahar Province.

*Description:* This feature is a circular mound measuring apx. 64 m by 61 m.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* The mound may date as early as the Neolithic Period.

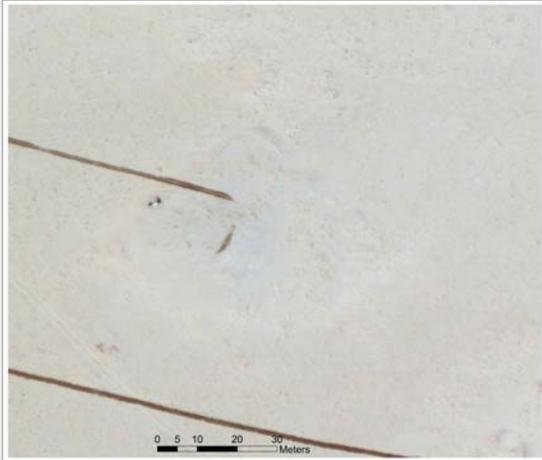
*Comparative features:* none.

### **Feature 102 (Square/rectangular Feature)**

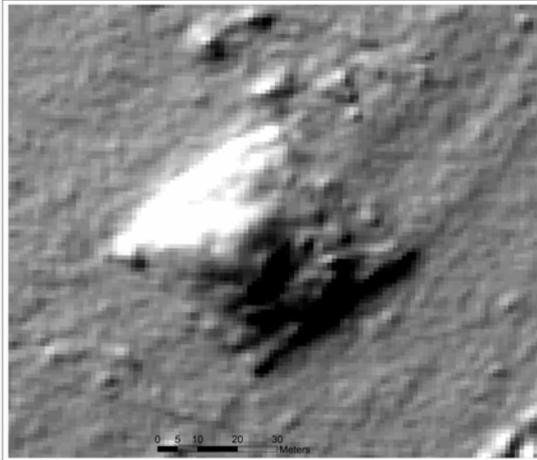
*Location:* Situated apx. 1.2 km northwest of Khodaydad Akhundzadah Kariz Village and 2.04 km northwest of Nawabad Village. Feature 102 is situated apx. 2.89 m southwest of Feature 101 and 98 m south of Feature 103. Maywand District, Kandahar Province.

*Description:* This feature is a square feature that measures apx. 50 m by 50 m.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

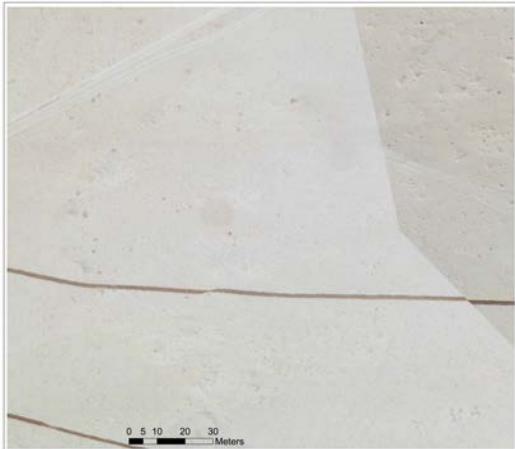
*Comparative features:* None.

### **Feature 103 (Square/rectangular Feature)**

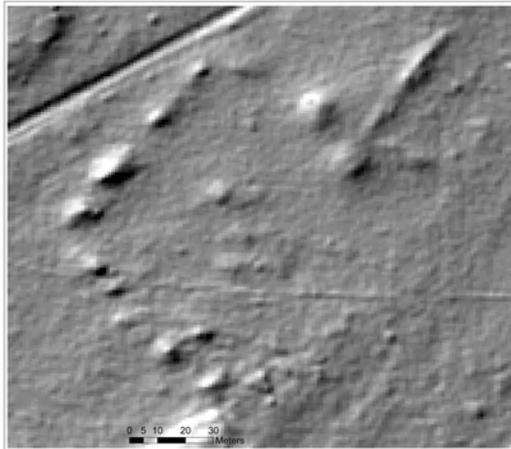
*Location:* Situated apx. 1.3 km northwest of Khodaydad Akhundzadah Kariz Village and 2.08 km northwest of Nawabad Village. Feature 103 is situated apx. 111 m southeast of Feature 101 and 98 m north of Feature 102. Maywand District, Kandahar Province.

*Description:* This feature is an unknown structure (93 m by 143 m) that may include walls.

*Image:*



*Hillshade model:*



*(orthoimagery courtesy of USAGC, 2008; hillshade derived from Lidar data from USAGC 2008).*

*Dates:* May date as early as the Medieval or Historic Periods.

*Comparative features:*

## Feature 104 (Scars: Nomadic or Semi-sedentary encampment)

*Location:* Maywand District, Kandahar Province.

*Description:* This feature is a series of “scars” on the landscape that may represent low or short walls from associated with tents. See Feature 3 for an in depth discussion of these types of features. The wall surrounding the encampment measure apx 255 m by 281 m.

*Image:*

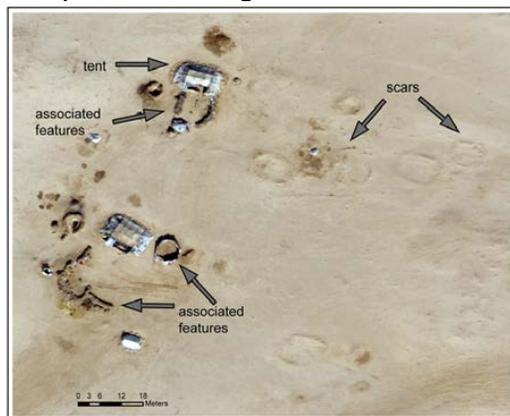


*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* undetermined.

*Comparative features:* Similar features within the Maywand study are include Features 3, 6, 7, 15, 16, 25, 36, and 85.

*Comparative Image:*



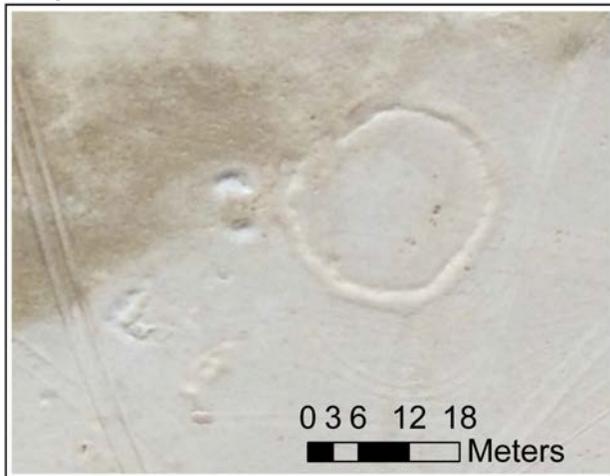
*(orthoimagery courtesy of USAGC, 2008).*

**Feature 105 (Circumvallation Feature: Circular)**

*Location:* Situated apx. 4.7m northwest of Capozai Village and 2.09 km west-southwest of Gach Karez Kalay Village. Feature 105 is situated apx. 347 m northwest of Feature 104 and 753 m northeast of Feature 33. Maywand District, Kandahar Province.

*Description:* This feature is a circular circumvallation feature measuring apx. 23 m by 21 m.

*Image:*



*(orthoimagery courtesy of USAGC, 2008).*

*Dates:* May date as early as the Medieval or Historic Period.

*Comparative features:* None.

## **C.5. Final Considerations**

This paper is the catalog portion of the Archaeological Gazetteer of Maywand District. This catalog provides a description of individual features identified using remotely sensed data in the Maywand study area and comparative data for the features. Additionally, this paper presents broad regional considerations for a number of the features identified. Thus far, one of the ways to associate time periods with the features identified is through a comparative analysis of site plans in the Archaeological Gazetteer of Afghanistan (Ball 1982) as well as the literature discussing architectural styles of Afghanistan (Hallet and Samizay 1980; Samizay 2003; Szabo and Barfield 1991).

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